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Financial and Business Cycle in China

Finanční a hospodářský cyklus v Číně

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List of Abbreviations
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Annexes

References:

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"Herewith I declare that I elaborated the entire thesis, including all annexes independently."

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Content

1. Introduction

Since the global financial crisis outburst in 2007, the relationship between the financial cycle and the business cycle and the mechanism of their interaction have returned to the center of academic research. Previous currency crises and financial crises have proved that financial factors may have a significant impact on the business cycle development. China is one of the most rapidly growing countries in the world. Since the outbreak of the global financial crisis in 2008, China's annual contribution to global economic growth has exceeded 30% on average. From the aspect of economic growth rate, the U.S. economic growth rate is between 2% and 3%, EU is about 2%, while China maintains steady pace growth of around 6.9%. Therefore, China's economic growth is of great significance to the global economy and forms undoubtedly an interesting sample to analyze.

In recent years, China's economy has been increasingly affected by factors such as internal and external currencies, credit growth and capital markets development. At the same time, China's economic development has many features that are different from other countries. For example, China's economic development is dominated by the government rather than the market. At the same time, it is of great significance to rationally implement macro-financial and economic controls to make the economy stable, healthy, and ordered.

In the thesis, I study the relationship between the financial cycle and the business cycle from the perspective of credit expansion and real economy fluctuations. On the basis on the empirical findings, I propose some effective macro-control policy recommendations.

The analysis is based on GDP and bank loan data from 1990 to 2017 as indicators of business cycle and financial cycle. Methodologically, I rely on the Hodrict-Prescott (HP) filter analysis method, Dynamic Conditional Correlation Generalized AutoRegressive Conditional Heteroskedasticity (DCC GARCH) model, and Granger causality test. The theoretical basis of the HP filtering method is the spectrum analysis method of the time

series. The time series HP filter is to separate the higher frequency components from the different frequency components and to remove the lower frequency components. That is, to remove long-term trend items and measure only short-term random fluctuation items. For the purpose of the thesis, the HP filter is used to estimate the output and credit-to-GDP gap which are later on used as proxies for the business and the financial cycle. The advantage of the DCC-GARCH model is that explanatory variables are added to the mean equation to make the model more accurate. Its estimated parameters are also more accurate and can simultaneously reflect the dynamic fluctuation characteristics and correlations of multiple assets in multiple markets. In addition, it overcomes the influence of data variance, reduces the estimated parameter amount, and is relatively simple to calculate. I use the DCC GARCH model to better observe the dynamic correlation between data. The Granger causality test is to determine whether there is a statistical causal relationship between two variables of interest. I use Granger causality because it is a good indicator of the temporal relationship between data.

The rest of the thesis is structured as follows: in the second chapter, I present relevant theoretical knowledge of the business cycle and the financial cycle. In the third chapter, I introduce the development of China's economy and its specifics as well as current challenges. In the fourth chapter, I employ various empirical methods to analyze the relationship between the business and the financial cycle using China macroeconomic data on GDP and stock of bank loans.

Keywords: business cycle, causality, correlation, financial cycle, real GDP, stock of bank loans

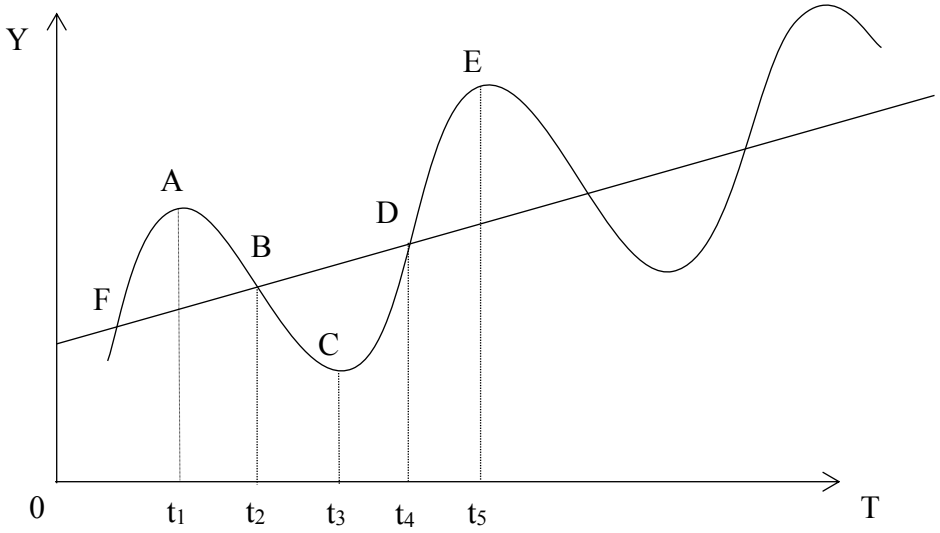
2. The Concept of a Financial and Business Cycle

An in-depth analysis of financial and business cycle fluctuations and mutual relationship is crucial for a formulation of sound macro-control policies. Claessens and Terrones (2012) studied financial and business cycle data from 44 countries from 1960 to 2007 and found that there is a strong correlation between the business cycle and the financial cycle. In another study, Claessen et al. (2012) analyzed the performance of major macroeconomic and financial variables during the evolution of business and financial cycles. They find that the business cycle and the financial cycle are in synchronicity, the business cycle interacts with the financial cycle, and the financial cycle will have a significant impact on the time and intensity of the economic downturn and the recovery. Drehmann et al. (2011) find that when both, the business cycle and the financial cycle are in a contraction phase, the subsequent recession is more pronounced.

2.1 The Business Cycle

The business cycle can be understood to as a cyclical alternation of the normal expansion and contraction of economic activity. It is divided into four stages: prosperity, recession, depression and recovery. The business cycle essentially reflects the process of deviation and adjustment from the equilibrium state of a country's economic system through time.

Figure 2-1 Business Cycle



In general, the economic cycle is divided into four stages: prosperity, recession, depression, and recovery (as shown in Figure 2-1). Among them, A-B is a recession, B-C is a depression, C-D is a recovery, and D-E is a prosperity.

The first phase of the business cycle is a prosperity, which represents the peak of the economic activity. It is characterized by rapid increases in production, increased investment, credit expansion, rising price levels, rising employment and generally optimistic future expectations of economic agents. The second phase is a recession, the period of stagnation or even negative growth in the economy. According to National Bureau of Economic Research definition, which is the one most widely used, economy experiences recession if real economic activity declines by two consecutive quarters. In macroeconomics, we may associate real economic activity with country's real gross domestic product (GDP). The general feature of a recession is a sharp decline in consumer demand and investment, fall in demand for labor, a sharp decline in corporate profits, and a general decline in asset prices. The third phase is a depression which refers to a wide-scale and long-lasting recession. In general, the depression may be characterized as a serious recession. A widely accepted criterion is a recession lasting three years or more. Its distinctive feature is a serious lack of demand, decreases in sales, deflation pressures, falling corporate profits, decline in production, growing number of bankruptcies and delinquencies, and rise in unemployment. The lowest point

of the recession is called the trough when employment and output fall to a minimum level. The fourth phase is called a recovery which refers to the transition from depression to prosperity when the economy starts to pick up from the though point but it has not yet reached the prosperity.

The business cycle is characterized by recurrence. Economic prosperity, recession, depression and recovery appear alternately. During the prosperity phase, a rapid economic expansion may lead to an overproduction (a contradiction between production and consumption). This may lead to a sharp reduction in the scale of production, business failures and soar in unemployment which sends the economy right into the recession stage. During this period, production plummets, prices drops, economic conditions continue to decline, and the economy might even enter a depression phase. After this, (following some economic policy intervenstions or market corrections) the economy begins to recover and the cycle repeats.

2.2 Keynesian vs. Neoclassical Business Cycle Theory

It has been nearly two hundred years since the first studies on the causes of the business cycle. Western scholars have put forward many points which can be summed up in two theories: endogenous and exogenous. Endogenous theory explains the reasons why the economy cycles around its potential. These factors include investment, consumption, savings, money supply and interest rates, etc. On the other hand, the exogenous theory believes that the root cause of the business cycle lies in the fluctuation of certain things outside the market economy system. Such as armed conflicts, revolutions, oil price fluctuations, emigration, scientific breakthroughs and technological innovations, even sunspots and weather. The most representative business cycle theories include the Keynesian and Neoclassical business cycle theory.

2.2.1 Keynesian Business Cycle Theory

Keynesianism believes that the reduction of aggregate demand for commodities is the main cause of the economic recession (Keynes, 1935, p. 126). Keynesianism is a theory

that discusses business cycles from a motivational perspective. There are three motivational laws affecting people's consumption and investment. The first is the law of diminishing marginal consumption. The increase of people's income can stimulate the increase of consumption. In the initial stage, the increase of income is directly proportional to the increase of consumption and the consumption enthusiasm is higher. However, as the income increases to a certain extent, and the rate of increase in income exceeds the rate of increase in consumption, the enthusiasm for consumption decreases. The second law is that of diminishing marginal efficiency of investment. Similar to the logic of law of marginal propensity to consume. The third law is the liquidity preference rule. People are psychologically inclined to hold cash (due to transaction purposes, cautious and speculative motivation)

In the later stages of prosperity, as the economic agents who have idle funds are becoming more optimistic about their future returns, the production costs will gradually increase and the interest rates will rise. This can lead to the following two situations. First, labor and resources in general becomes increasingly scarce, leading to a rise of prices of resources, resulting in a continuous increase in the cost of capital goods. Second, coupled with the increase in production costs, marginal efficiency of capital decreases and so do profits. However, because economic agents are too optimistic, they still choose to invest as they are overly optimistic about future returns, causing excessive purchases and a sudden collapse in the marginal efficiency of capital. This may cause economic agents to suddenly lose confidence, resulting in a substantial increase in liquidity preferences and rising interest rates, causing a sharp drop in investments.

At the recession phase, economic agents lack confidence and the marginal efficiency of capital is hard to recover. Meanwhile, bankers and businesses cannot operate the market, resulting in sluggish investment due to a sluggish, shrinking production, underemployment and backlogs of goods and inventories. With the gradual recovery of the marginal efficiency of capital, investments increase, interest rates drop and the economy enters a recovery phase. Keynesianism believes that the reason for the

formation of the business cycle is mainly the cyclical change in the marginal efficiency of capital. This theory has the following three characteristics. First, the level of national income depends on aggregate demand. Second, this theory is based on investment analysis, i.e. to analyze the reasons for the changes in investment to explore the formation of the business cycle causes, processes and effects. Third, it is based on the analysis of national income decisions.

2.2.2 Neoclassical Business Cycle Theory

Neoclassicals believe that prices and wages are fully elastic, and supply determines output and demand. Changes in supply can thus cause economic fluctuations while price changes have nothing to do with changes in output. According to the causes of economic fluctuations, the neoclassical theory is divided into two schools of thought, namely, the monetary business cycle school and the real business cycle school. Both schools consider the factors that affect the business cycle to be exogenous.

Monetary business cycle theory explains the periodicity of economy from "leisure substitution effect". If the price of a product changes permanently, economic agents will not increase their working hours because of the zero or negative elasticity of long-term labor supply and the increase in the profit and loss of the proceeds from the sale of the product. If the change in the price of the product is temporary, then the leisure and labor time are mutually substitute. People work longer when the product price is higher, which leads to an increase in output and employment. Conversely, when prices of products are low, there will be a decrease in output and a drop of employment. Then a small price change can bring greater output and employment fluctuations.

Relative price fluctuations affect workers' behavior without affecting the total economy. In the economy, changes in relative prices caused by for instance, changing technology and consumer preferences can have a large impact on individual economists. However, technology and consumer preferences may be offset by the interaction between markets, so changes in relative prices do not affect the volatility of the economy.

Monetary business cycle theory attempts to explain economic fluctuations based on the supply theory of microeconomics. If the price increase of the manufacturer's product is the same as the increase in the total price level, that is, the relative price of the product has not changed, the manufacturer will not increase the output. If the relative price of the product increases, the manufacturer will increase the output. Although manufacturers supply decisions are closely related to fluctuations in the general price level, but at their disposal price information is asymmetric. Due to information barriers, vendors cannot obtain enough information, so forecasts of changes in economic variables are not completely accurate. Changes in economic variables that have been forecasted will not cause changes in the actual production of the product. This is because manufacturers can predict changes in the overall price level based on changes in economic variables and adjust the prices of products. Changes in unpredicted economic variables will cause manufacturers to delay the adjustment of the prices of products. This will change the relative price of the product, which will affect the product's output and employment status.

The monetary business cycle theory holds that unpredicted changes in economic variables will change output and employment, and currency will be non-neutral in the short term. But in the long run, people can get real price levels and currency is neutral.

The real business cycle theory holds that there are four defects in the monetary business cycle theory. First, the model established by the monetary business cycle theory only considers the supply side and does not consider the demand side, thus affecting the conclusion of the model. Second, the correlation between output and general price level is weak. Third some assumptions about the currency cycle model are not reasonable. The theory of real business cycles holds that actual factors have caused economic fluctuations. The actual factors that cause economic fluctuations include innovations in production technology, development of new products, changes in climate, changes in raw material prices, changes in energy prices, and so on. They exert their effect mainly by moving the production function.

There are three main points in the debate between Keynesianism and Neoclassicism.

First, they argue whether money is neutral or non-neutral, meaning whether changes in money supply affect the economy or just the price level. Keynesians view money as non-neutral and as a result, the monetary policy is believed to be important in the task to smooth the business cycle fluctuations. The theory of (neoclassical) monetary business cycle theory believes that money are neutral in the long run. This theory holds that in the product market, prices change rapidly with changes in supply and demand. That is, when supply is greater than demand, prices decline rapidly; when supply is less than demand, prices rise rapidly. Therefore, the currency is neutral in the long run. Because the price is fully scalable, the product market can often be in a clear state of supply and demand balance. Second, they dispute whether the market is a perfectly competitive market. One side advocates liberalism and one side advocates government intervention. Keynesianism believes that the market is in an unbalanced state for a long time and government intervention is very necessary. Neoclassicism believes that the government should act in accordance with stable policy rules to avoid economic fluctuations caused by sudden changes in policies. And it advocates liberalism. Third, they do not agree on the reasons for the business cycle fluctuations. Keynesians believe that economic fluctuations are the results of price stickiness and sticky wages. Neoclassicals believe that business cycle fluctuations are caused mainly by currency or technological shocks.

There are mainly four major outcomes of the great neoclassical synthesis (i.e. merging of the Keynesian and Classical thoughts). First, changes of the aggregate demand will affect output only in the short term. Second, in the medium-term output will restore the level of natural productivity. Third, changes in potential output levels are determined by long-term capital accumulation and technological progress. Fourth, monetary policy can affect output in the short term, but not in the medium to long term.

2.3 The Financial Cycle

According to Borio (2012), financial cycle refers to self-reinforcing interactions between perceptions of asset value and risk, attitudes toward risk and financing

constraints. This interaction amplifies economic volatility and can lead to serious financial difficulties and economic dislocations.

Alessi and Detken (2009) and Schularick and Taylor (2012) found that credit is the most powerful early warning indicator of asset price fluctuations and financial cycle. Claessens et al. (2011) used NBER's business cycle turning point analysis to analyze the cyclical nature of credit, real estate prices and stock prices. They found that in terms of cycle frequency, credit cycles and real estate prices are more comparable to economic cycles, and inventory cycles are more frequent than economic cycles. In terms of the length of the cycle, the financial cycle is more protracted than the business cycle. At the same time, the duration of the rise in the level of credit period is usually longer than that of the descending period. As for the synchronicity of indicators, the cycle of credit and housing prices are highly synchronized.

As was mentioned above, Drehmann et al. (2012) believe the two core indicators of the financial cycle are credit and real estate prices. During the period of prosperity, credit expansion supports investment which stimulates both demand and supply Macroeconomic policies are less restrictive of inflation, and economic growth may be at a higher level for a long time. During the recession period, due to scares supply of credit, the investment declines and the economy growth rate weakens.

2.4 Financial Cycle Characteristics

The study of the financial cycle dates back to the 1980s, but until Bernanke et al. (1994) revised the premises of the gold neutral theory, the important role of financial factors in the business cycle fluctuations were neglected. Subsequently, the relationship between the business cycle and financial cycle started to be widely addressed by both academics, and policy practitioners. Da Silva (2002) used data from 40 sample countries to discuss the relationship between financial sector development and macroeconomic fluctuations and found that as financial markets improved, economic fluctuations decreased. The financial cycle is different from the business cycle in a number of ways. First, it does not have a very direct way to measure. Because of the

high relevance of credit and residential property prices, the simplest way to describe the financial cycle is to describe the development of the two time series. Second, the financial cycle has a longer duration and greater volatility than the business cycle. Drehmann et al. (2012) based on a sample study of seven industrialized countries since the sixties found that the average length of the financial period is 16 years. Third, the peak of the financial cycle is often associated with a financial crisis or great pressure of the financial market and asset prices.

Similarly to the business cycle, the financial cycle is also closely related to central bank policies. The two core indicators of the financial cycle are credit and real estate prices. Real estate is an important collateral for credit, and the two are mutually reinforcing relations. The fundamental reason that the financial cycle has caused asset prices to rise and that general commodity prices do not rise is the expansion of loans. The loans that businesses and individuals receive from banks have two uses. One is to establish new assets, such as building new properties, new highways, which is to increase the demand for entities. The other is the purchase of stock assets in the secondary market, such as buying stocks. Therefore, the over-delivering of loans may be reflected in general price inflation, and may also be reflected in rising asset prices and asset bubbles.

In the first half of the financial cycle, the prosperity of the real estate market can drive the increase in investment in real estate development and related upstream and downstream industries to stimulate demand growth. However, from the perspective of supply, the rise in real estate prices has increased the operating costs of other industries. Credit expansion has led the financial sector to occupy more social resources. The squeeze effect of the two on manufacturing and physical services has become more and more serious with the rise in real estate prices, and it has also worsened the economic structure. The rise in real estate prices and credit expansion have increased the gap between the rich and the poor in society, restrained consumption, and hindered the accumulation of human capital. In the second half of the financial cycle, the process reversed. Although the decline in real estate prices and the credit crunch have reduced the growth of the total economy, the economic structure has been improved, which is

conducive to the sustainable development in the medium and long term.

2.5 Interaction between the Business Cycle and the Financial Cycle

Financial cycle can be divided into systemic risk accumulation and materialization phase and the surrounding periods of what can be understood to as normal times, characterized by a low credit and asset price growth.

The accumulation period is characterized by a gradual systemic risk build-up. In general, as the systemic risk increases, the probability of a financial stress in the subsequent period grows. At the peak of the financial cycle, the probability of a financial crisis is high. The systemic risk materialization phase is generally accompanied by a drop in the growth of credit and financial leverage. If this is the case for most of the financial sector, there is a significant increase in the risk of credit rationing. This can easily lead to the depletion of liquidity and thus to the financial crisis. If the financial crisis manifest itself in other economic sectors, a recession might follow.

Due to factors such as excessive loosening of the credit environment and asset price bubbles, coupled with the "inaction" of monetary policy, financial imbalances and systemic risks in the economic system continue to accumulate. Financial imbalances and the release of systemic risks are often due to the financial system being affected by changes in the direction of monetary policy or changes in market risk preferences. Afterwards, it was amplified by the financial system and transmitted to the real economy through channels such as financial accelerators, which eventually led to a sharp decline in the economy.

The correlation between systemic risk and the real economy lies in the interaction between them. The risk of the financial system will bring a negative blow to the real economy through various channels such as credit and capital markets. The problems that arise in the real economy can also be a trigger for systemic risks in financial institutions or industries. This mutual influence and infection between entity and finance is likely to become an unstable factor that hinders economic growth. Systemic

risks are transmitted through inter-bank payment settlement systems and interbank market peers. This will affect the stability of the financial system. Systemic risk is mainly transmitted to the entity through the channel of credit, which in turn has a negative impact on the macro economy.

The rise in asset prices increases the value of the assets that can be mortgaged, which increases the ability of borrowers to obtain bank loans. If there is a possibility of profit, the borrower's demand for loans will increase. As a result, the proportion of bank assets exposed to risks has been expanded, thus creating hidden risks for the occurrence of financial systemic risks. When asset prices turn down, the value of borrowers' assets available for mortgage declines. As a result, their ability to obtain credit was reduced, investment was reduced, and bank loans were further reduced. When the value of collaterals falls by a large margin and the borrower can even abandon the collaterals and default, the possibility of losses suffered by various departments will be transmitted in a wide range. And then it has a negative impact on the real economy.

Financial systemic risks are common in the financial system and are the root cause of the financial crisis. From the individual perspective of financial institutions, external market factors and risk spillovers by other institutions can affect a certain financial institution through various channels. This will cause certain difficulties for the normal operation of the institution and it is likely to accumulate inside the institution until the institution goes bankrupt or closes down. From the point of view of the entire financial system, systematic risks will accumulate as the exposure of individual institutions increases and the market structure changes. Systematic risk will cause a comprehensive financial system crisis and cause serious losses after reaching a certain level.

There is a close link between the intensification of the financial crisis and the deterioration of the economic situation. When a serious panic erupts, the overall economy will inevitably be hit hard. The decline in the profitability of the financial industry will lead to layoffs in the financial industry and will also affect employment in other industries, putting the employment market under severe pressure. At this point, the unemployment rate has risen. The second impact of the financial crisis on the real

economy is the shrinking of consumption. The financial system that is generally lacking in funds, while limiting the number of corporate loans, is also reducing consumer credit, leading to a reduction in consumer spending. This also led to the economic downturn. After a certain period of time, this situation is very likely to develop into an economic crisis.

After the economic crisis, various systemic risks will be exposed. For different issues, the government will issue corresponding solutions. With the implementation of these methods, the real economy will be slowly restored.

3. Specifics of the Chinese Economy

Liu Jinquan, Liu Zhigang and Yu Dong (2005) found that there is a significant "pulling effect" in the fluctuation of China's business cycle, and the possibility of magnification effect in the economic fluctuation is greater than the possibility of producing a contraction effect. The amplification effect refers to the superposition of external demand and the negative factors of China's economic cycle, which intensifies economic fluctuations. The contraction effect refers to the economic fluctuations. Peng Wensheng (2016) argue that the Chinese financial cycle is a result of the policy of financial liberalization over the past few decades. In the early 20th century, liberalization dominates. The problems it brought about the bubble of assets, financial crises and the polarization between the rich and the poor. Peng Wensheng further argues that the Keynesian theory and government intervention dominated the economic landscape after the second World War. In order to solve the problem of insufficient effective demand, Keynesians advocated abandoning economic liberalism and replacing it with the guidelines and policies of state intervention. The great crisis of the 1930s left the capitalist economy in a state of collapse, and the traditional “laissez-faire” economic policy was unable to reverse the economic downturn. The US Roosevelt government adopted a national intervention in the economy, which has, to a certain extent, lessened the serious damage caused by the economic crisis. At the same time, this measure also promoted the development of social productivity and consolidated capitalist rule. The

state's intervention in economic policies has also had a major impact. After the WWII, the capitalist countries further strengthened their intervention in the economy, implemented the nationalization policy, paid attention to the planned nature of the national economy, and implemented a wide range of social welfare systems. Together with the use of the results of the third scientific and technological revolution, capitalism has entered a "golden age" of rapid development. The theory of the state intervening in the economy has thus been widely believed.

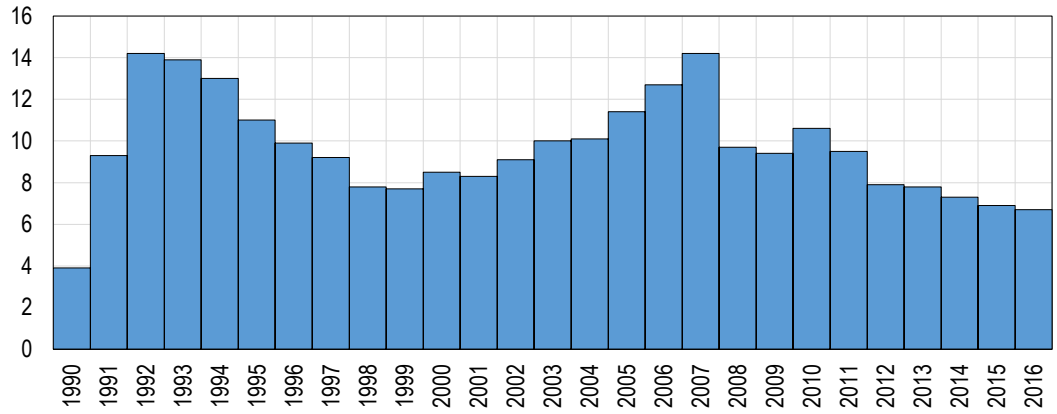
The post-war planned economy in Asia, embodying the socialist countries such as the Soviet Union and China, is consistent with the general direction of the Western government-interventionist economy but with different degrees. After the disadvantages of the planned economy were highlighted, Deng Xiaoping (the second generation of Chinese Communist Party leaders in the core leadership) began to carry out the reform and opening up in China in the late 1970s. Other countries, especially the Soviet Union, also canceled the planned economy one after another. Market-oriented reforms have brought along rapid economic development in China and greatly improved people's living standards. However, with the passage of time, the issue of asset bubbles, financial risks and the division of the rich and the poor has become increasingly prominent.

3.1 China's GDP Analysis

The following content can be obtained from the following figure 3-1. In 1990, China took measures to stimulate economic recovery by expanding investment. A year later, China’s economic growth was driven out of the bottom by investment. Economic growth increased rapidly in 1991, reaching a peak of 14.2% in 1992. Economic growth began to turn back from 1993, China's GDP growth rate dropped for several years in a row, from 14.2% in 1992 to 7.6% in 1999. The continuous decline in GDP growth in 1993-1998 was caused by the abnormal increase in investment in 1991-1993. During this period, chaotic and blind investment caused the overheating of China's economy. As a result, real GDP in 1992, 1993, and 1994 increased by 14%, 13.5%, and 12.6%.

Sustained high output leads to high demand, which in turn leads to overproduction and double-digit inflation in 1993-1995. Since 1994, the Chinese government has begun tightening new investment plans, making the growth rate of investment in the normal direction, and the GDP growth rate has dropped. Due to the impact of the Asian financial crisis in 1998, the Chinese economy continued to decline before 1999. China first faced the effects of the financial crisis and deflation. It somewhat recovered in 2000 with a growth rate increase to 8.4%. In this round of business cycle, the trajectory of China's economic growth has gone through a decade-long decline from 1993 to 2001.

Figure 3-1: China's Nominal GDP Growth Rate (in %)



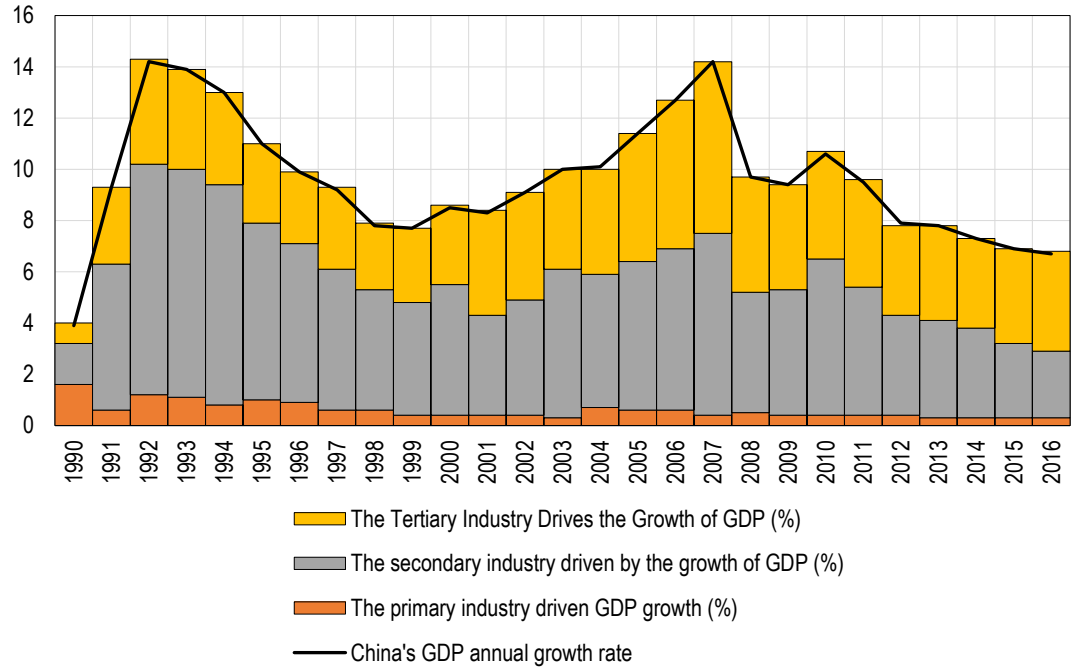
Source: China National Bureau of Statistics

In 2002, China's business cycle entered a new round of growth, and its GDP growth rate began to rise slowly. November 10, 2001 China's accession to the World Trade Organization(WTO) has promoted China's economic growth. Since 2003, GDP growth has achieved double-digit growth. Economic growth peaked in 2007, with a peak of 11.9%. The GDP growth rate dropped sharply in 2008.

Since 2010, China's GDP growth rate has shown a downward trend. The overall downturn in the world economy is the main reason for this round of economic downturn in China. China is a big exporter. The relationship between domestic economy and exports is inextricably linked. The overall weakness of the world economy affected China’s exports and caused the Chinese economy to decline. As a country in transition, China certainly has many internal issues. These internal issues include China’s

economic system. For example, the share of state-owned enterprises is still quite high. At the same time, the operating conditions of state-owned enterprises are not good. According to data from the China Report Hall, there are 274 state-owned enterprises among the top 500 Chinese companies in 2017, accounting for 54.8% of the total. This is the first time that the number of state-owned enterprises has fallen below 60% since the release of the Top 500 Chinese Enterprises list in 2002. In addition, the Chinese high-speed rail market mechanism has not yet been fully implemented. Although the Third Plenary Session put forward comprehensive deepening of reforms, many measures have not yet been fully implemented. Since the market has not fully played its role, there will be problems with the allocation of resources. This is one of the reasons for the economic downturn in China.

Figure 3-2: China's GDP Growth Decomposition (in %)



Source: China National Bureau of Statistics

Figure 3-2 shows, at present, China's economy has witnessed a turning point since 2015, its economic growth rate below 7% for the first time in nearly 10 years, and it has been the year with the lowest growth rate since the Reform and Opening. Reform and Opening was the policy of internal reform and opening to the outside world that China

began to implement at the Third Plenary Session of the Eleventh Central Committee in December 1978. Internal reforms include economic restructuring, that is, reforming a highly centralized planned economic system into a socialist market economy. Due to the global economic recession triggered by the subprime mortgage crisis in the United States in 2008 and the debt crisis in Europe in 2012, the global economic development has been stagnating. The economic crisis in 2008 created a pessimistic atmosphere in the Chinese capital market, and the assets of these financial institutions held by China would shrink. Overseas investors sold a large number of Chinese assets back to their home countries to save themselves, thereby exerting downward pressure on the Chinese capital market. But more importantly, China's economy is highly outward-looking, with the total value of imports and exports exceeding 60% of GDP. As a result of the economic crisis, many countries that trade with China, especially the United States, have significantly reduced their trade volume, which has led to a drop in the Chinese economy and a drop in the GDP growth rate. Weak external demand, China's economic development is mainly driven by investment and exports, the weak global market to China's economic development has brought great pressure. The impact of the European debt crisis on China's economy largely depends on the economic and trade relations between the two countries. According to the European Union's trade data released by the European Bureau of Statistics, cumulative EU-China imports and exports in January-April 2011 totaled 135.7 billion euros, a year-on-year increase of 20.1%. China is second only to the United States and continues to maintain its position as Europe's second largest trading partner. Among them, Europe exports 43 billion euros to China and accounts for 8.8% of total European exports. China is still the second largest export market in Europe. Europe imports 92.7 billion euros from China and 16.7% of total European imports. China continues to maintain Europe's largest import source. The tightening policies of European countries directly reduce China's external demand. The avoidance of high-risk assets by investors led to the continued devaluation of the euro, which caused the yuan to passively appreciate against the euro. The European debt crisis has caused European trade protectionism to rise, resulting in more intensive anti-

dumping actions against China. The large flow of short-term capital stimulated by the European debt crisis, coupled with the EU's tendency to adopt loose monetary policies, will create a risk of “hot money” inflows to China, further aggravating the pressure on China’s imported inflationary pressure box for RMB appreciation. China has always been the most important engine of global economic growth. Reached a critical point in 2015, shifting from the rapid growth of the golden decade to a medium-high-speed growth. Although China's total economic output ranks second in the world, its per capita GDP is still low. From 2011 onwards, China's GDP growth rate has been in decline, the growth rate of the three major industries slowed down significantly. China's economy has entered a stage of medium-speed growth.

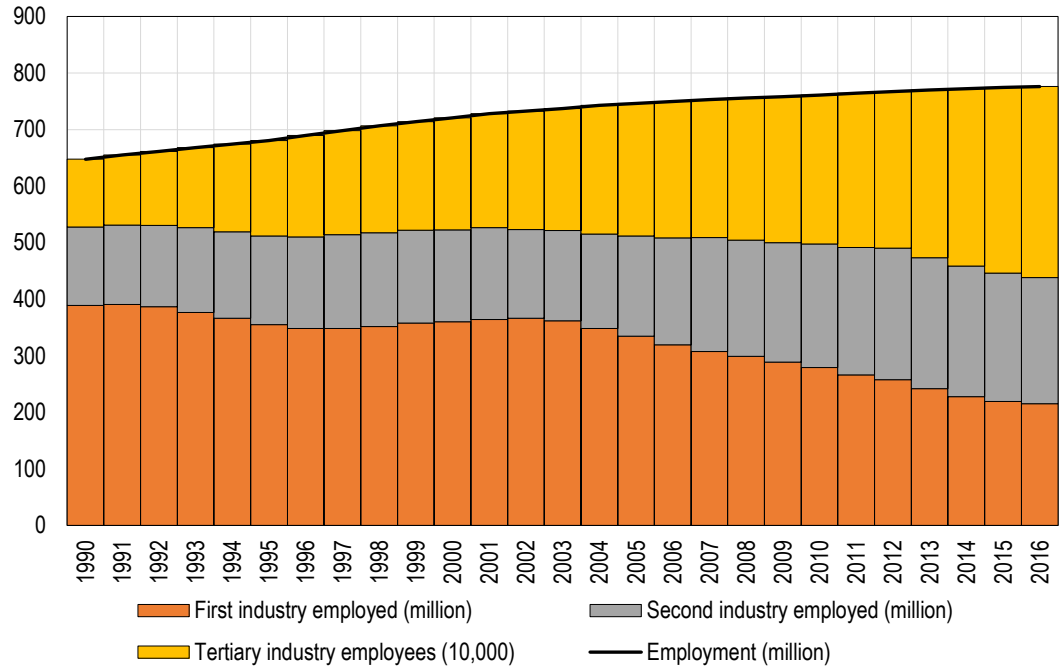
Since 1991, China's economy has been growing at an extremely high rate, reaching 14.22% of its first peak in 1991 and 14.23% in 2007, the second peak. However, since 2007, China's GDP growth has been on the decline, starting from 2012 to end the rapid growth of nearly 10% in 20 years and turn into the growth-shifting period. In 2012, China's economic growth rate was 7.86%. In 2013, China's economic growth rate was 7.66%. In 2014, China's economic growth rate was 7.30%. It even fell below 7% in 2015 and continued to decline by 0.2% in 2016.

The influence of primary industry and secondary industry on GDP has been weakened since 1990, and the impact of tertiary industry on GDP has been deepening. The composition of China's GDP also evolves mainly from secondary industry to tertiary industry.

3.2 Development of China's Economy.

In the first three decades after entering the reform and opening up, the Chinese economy has achieved ultra-high-speed development. China became the world’s fastest growing country in the same period and became the third largest economy in the world.

Figure 3-3: China's Employment (in ten millions)

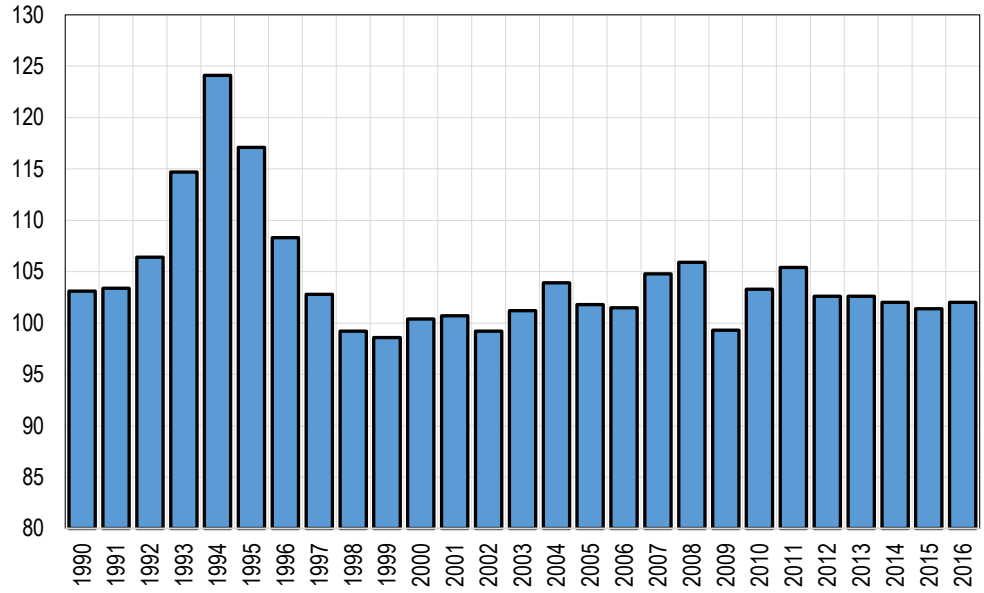


Source: China National Bureau of Statistics

It can be seen from Figure 3-3. Since 1990, employment in China has shown an increasing trend year by year. In 2016, the number of employed people in China maintained a steady increase. By the end of 2016, the number of employed people in the country was 7760.3 million, an increase of 15.2 million from the previous year. It can be seen that the employment situation showed a basically steady trend.

In these 26 years, China's employment structure has undergone major changes, from the development of primary industry to the development of tertiary industry. Employment in the primary industry showed a downward trend. At the same time, the share of total employment dropped from 60.0% in 1990 to 27.7% in 2016. Employment in the tertiary industry increased significantly, with the share of total employment increasing from 18.5% in 1990 to 43,5% in 2016.

Figure 3-4: China's CPI (previous year = 100)



Source: China National Bureau of Statistics

In China, according to the statistics of the National Bureau of Statistics, CPI refers to the price paid by urban and rural residents for purchasing consumer goods and services and is the final price of social products and services. The point here is that the commercial housing has not been included in the CPI statistics.

As apparent from Figure 3-4, China's CPI is steadily rising. Since 1990, China's CPI has continued to grow. After three years, it reached a peak in 1994. In the next five years, CPI slowly reached the bottom and turned negative. In 2000 and 2001, China maintained a relatively low price level. In 2002, CPI experienced a slight decline. Afterwards, the CPI continued to grow for two years and reached its crest in 2004. From 2005 to 2008, the CPI continued to grow and reached a new peak. Since 2012, CPI has stabilized.

Since 1991, the overall situation of the Chinese market has changed. The situation of market supply less than demand has gradually disappeared, and the seller's market has changed to the buyer's market. The price level is relatively low. In order to stimulate economic recovery, in 1991 the Chinese monetary authorities adopted an expansionary policy of lowering interest rates, while also relaxing restrictions on the scale of

investment. Since 1992, the state has encouraged investment, resulting in excessive investment growth and overheated investment. At the same time, the rapid growth of residents' income has led to a rapid expansion of consumer demand. In order to solve these problems, the monetary authorities expanded the amount of money in 1992, and the amount of that year exceeded the sum of the previous three years. The ensuing years, under investment and stimulating consumption, resulting in price level continued to rise and reached a peak of 24.1% in 1994. In 2007, the sharp increase in the price of meat and poultry products led to an increase in food prices, which led to an increase in the price level. This is also the main reason why CPI reached the peak in 2008. After the outbreak of the financial crisis, the average annual growth rate of China's money supply was 25%, which exceeded the annual average growth rate of 7%, which led to the super currency. This is one of the main reasons leading to the rise of CPI in the following years. The rise in China's import prices caused by rising global energy and commodity prices, as well as rising domestic labor costs, are also the main reasons for the rise in CPI.

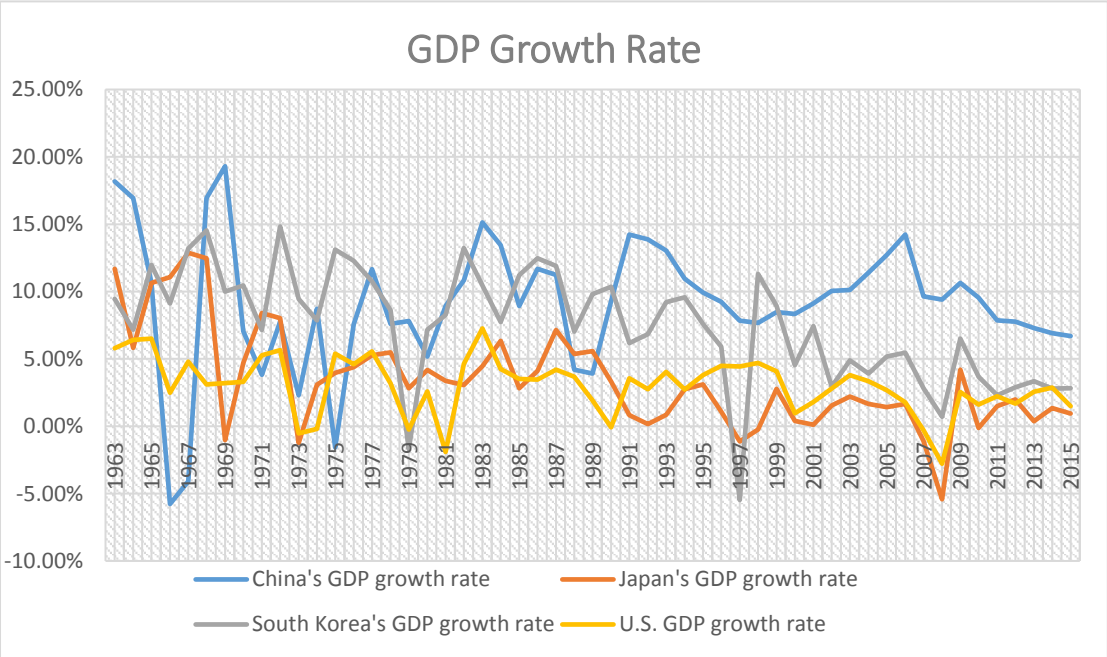
3.4 New Normal of China's Economy

The concept of "new normality" of China's economy was born in 2014 and was proposed by Chinese President Xi Jinping. The new normal of China's economy is based on the situation of China's economic development in the new period (since 2014). In fact, the term "new normal" was first proposed by Mohmed El-Erian, president of U.S. Pacific Fund Management. The "new normal" is generally described in the macroeconomic field as a slow and painful process of economic recovery after the crisis. However, the "new normal" of China's economy is a sign that China's economic development has entered a brand new phase, but not entirely caused by the international financial crisis. The content of the new normal of China's economy includes the speed, structure and power of the Chinese economy. As the international market is unstable, the cost of production factors has risen, resource constraints have intensified, and the rate of return on investment has declined. The Chinese economy has entered a new normal compared with developed countries. Generally speaking, the new normalcy of

developed countries refers to the slow economic recovery after the economic crisis and more emphasis on the market mechanism, especially the financial market. In essence, the new normalcy of the Chinese economy is a "major transition period" from the traditional steady-state growth to new steady-state growth (a stable state of rapid development to a stable state of moderate development.).

The new normal of the Chinese economy is the symmetry of the economic structure. It focuses on the symmetry of the economic structure and sustainable development based on symmetry, not just the growth of GDP, the maximization of per capita GDP and economic size.

Figure 3-5: GDP Growth Rate (in %)



Source: China National Bureau of Statistics

The first feature of the new normal is the transition from ultra-fast growth in the past to the current medium-high-speed growth. The medium-high speed low of 6.5% by 2020 is the bottom line. In fact, the economic slowdown is an economic law. Nowadays, many countries have experienced this stage. As can be seen from Figure 3-5, from 1961 to 1972, Japan's GDP grew at an average annual rate of 8.44%. From 1973 to 1990, the average annual growth rate dropped to 4.35% and from 1991 to 2016 to 1.01%. From

1961 to 1996, the average annual growth rate of South Korea's GDP was 9.37%, and it dropped to 4.15% between 1997 and 2016. After the 1960s, the United States GDP growth rate basically below 5%. China's average annual GDP growth rate was 10.01% between 1978 and 2011 and dropped to 7.30% between 2012 and 2016.

The second characteristic of the new normal is that the mode of development has shifted from the extensive growth of scale to the intensive growth of quality and efficiency. This is also the only way for China to shift from an economic power to an economic power and it is also a crucial step.

The third characteristic of the new normal is that the industrial structure is transformed from low-end to mid-to-high end. The low-end industry refers to the production of traditional raw materials and industrial primary processing products. High-end industries refer to industries with high technological content and high added value. China's industrial structure in 2013 appears a historic change. In 2013, China's tertiary industry (service industry) added value accounted for 46.1% of GDP, surpassing the secondary industry for the first time, marking China's economy officially entered a "service" era.

The fourth characteristic of the new normal is that the growth drivers are transformed from factor-driven to innovation-driven. With the rapid development of China's economy, the prices of China's resources, land and labor are constantly rising. In the past, the economic development mode driven by the low factor cost could no longer meet the needs of China's economic development. Therefore, in order to maintain the sustained growth of China's economy, it is necessary to shift development momentum to technological innovation.

3.5 Supply-Side Reform

Since the outbreak of the financial crisis in 2008, judging from the external environment of China's economic development, the global economy has fallen into a slump and global demand has fallen off the cliff. Since the accession to the WTO, the Chinese

economy has gradually failed to drive its external demand driven by basic industrial products. In terms of the internal environment, on the one hand, the cost of domestic economic development has systematically risen, the labor supply has shrunk and wages have continued to rise. Environmental pollution is serious, pollution control costs rise rapidly. Private-owned enterprises' financing caused by the structural defects of the financial system is hard. All these problems are constantly adding to the burden of factor costs. On the other hand, the disadvantages of late-arrival decline appear. After decades of learning and imitation, there is not much left over for technology and knowledge for low-cost learning and imitation. In the established learning and imitation space, can no longer bring further improvement in production efficiency. Excessive leverage leads to economic bubble, asset bubble distorts the wealth distribution structure, reducing the speed of monetary flow and financial operating efficiency, increasing the risk of economic fluctuations.

Due to the irrational economic structure, the negative effects of the implementation of Keynesianism have gradually become apparent in recent years. The stimulation of fake demand has led to overcapacity and excessive money supply has caused inflation and structural adjustment has been very difficult. At present, the Chinese economy is not facing short-term, cyclical and external shocks, but medium- and long-term, structural and internal pressures. The Keynesian policy was put forward in order to solve the immediate problem of the cyclical problems facing the Great Depression in the United States at that time. Keynesian policy from the theoretical basis, the core focus is the demand side. From the implementation effect, it is easy to see results in the short term; but in the medium and long term, it tends to result in increased debt, overcapacity and even declining growth rate. Keynesian policies to stimulate market demand, its economic growth after a short-term recovery, it is easy to re-enter the decline, or even stagflation, speeding up the economic restructuring without delay.

In the past, China adopted too much government demand management policies, especially government investment policies and monetary and monetary policies, to pull economic growth from the demand side "troika." Excessive government intervention in

the market, "visible hand" stretched too long. Now, in order to place more emphasis on the balance between supply and demand, China will moderately increase its aggregate demand and at the same time strengthen its supply-side structural reforms. In particular, it is necessary to give more play to the role of enterprises and individuals and fully mobilize their enthusiasm and creativity. The main responsibilities of the government should be to formulate laws, regulations, standards and policies and provide a sound institutional and policy environment for enterprises and the society.

In the past, China's development was more focused on the demand side, with demand comprised of "troika" of consumption, investment and net exports. Mainly rely on exports, investment, infrastructure and other demand-driven economic development. With the lack of motivation for economic development, some of the country's economic stimulus policies are also focusing on the demand side, leading to serious overcapacity, mainly in the energy, infrastructure and textile industries such as steel, coal, real estate and textile. The new government realized that by economic stimulus has been unable to continue to make rapid economic development, we must seek industrial restructuring and upgrading.

3.6 China's Economic Problems

After the reform and opening up, China's economy was booming at a rapid pace with GDP ranking second in the world. However, during the rapid economic development in China, many problems have also accumulated. The economic mode of pulling China through investment, consumption and net export of these "troikas" can no longer meet the needs of China's economic development. At present, China's economy is in a downward phase and its GDP growth rate is also declining. As the economic reform progresses in exploration, several major problems China is facing urgently need to be resolved.

In the past three decades, China has paid special attention to GDP. The GDP competition among the two local governments in China is an important reason for the rapid economic development. However, this has also led to the preference of local

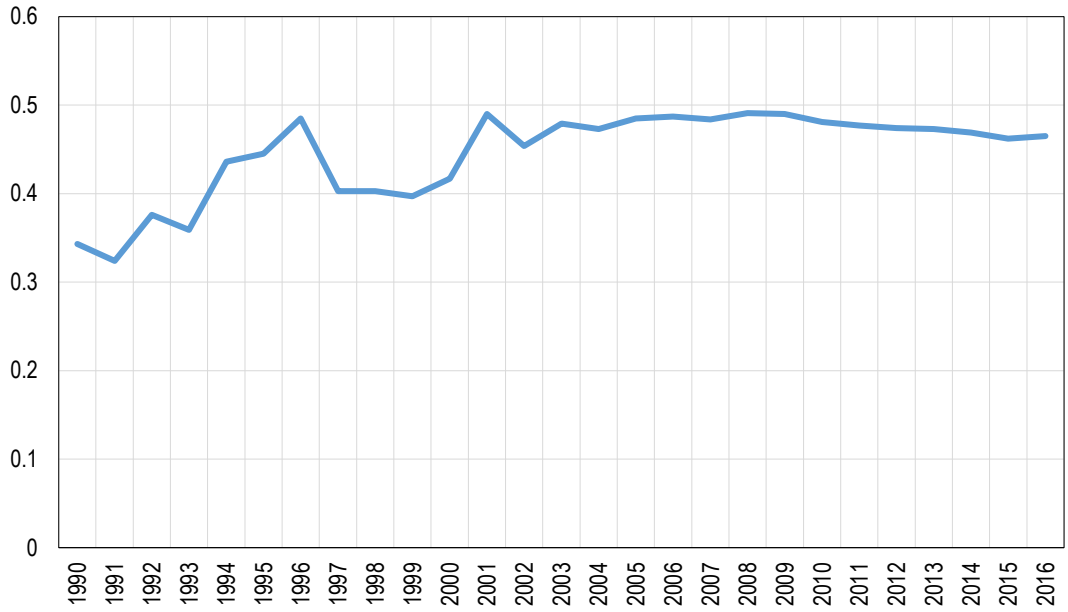
governments for boosting economic growth by pursuing high GDP. To invest in real estate, infrastructure and other fixed assets to stimulate economic growth, resulting in a huge amount of local debt. At the same time, due to the high cost of these projects and the long payback period, the capital chain of the bank is occupied for a long time.

Serious energy consumption, waste of resources and environmental pollution problems are becoming more and more prominent. The long-term implementation of our country is a extensive mode of economic growth. The traditional exploitation of coal resources not only wastes resources but also causes environmental pollution, reduces the economic benefits of enterprises and causes great losses to social and economic development.

Overcapacity is also an important issue facing China. In many industries such as steel and coal, the supply and demand are seriously mismatched. Supply-side structural reform can effectively solve this problem, but there are still many problems in the process of going to capacity. Enterprises in the coal, steel and other industries generally have higher debt levels. How to deal with the debt problems of corporate mergers and reorganizations? Corporate bankruptcy, a large number of unemployed how to resettle? All kinds of problems need to be solved one by one.

The gap between rich and poor is still large.

Figure 3-6: China's Gini Coefficient



Source: China National Bureau of Statistics

The Gini index is often used to represent the distribution of wealth in a country. Internationally, 0.4 is usually used as the "cordon" of the income distribution gap. As can be seen from figure 3-6, while the Gini index in China exceeded the warning level between 2000 and 2016. Since 1990, the Gini index in China has shown an upward trend. It shows that the gap between rich and poor in China is getting bigger and bigger. Although the Gini index has shown a downward trend since 2009, the decline is smaller.

3.7 Monetary policy in China

With the development of China and the improvement of the economic level, China’s monetary policy is constantly changing. China's monetary policy instruments are the means adopted by the central bank to achieve monetary policy goals. According to the "People's Bank of China Law," the ultimate goal of China's monetary policy is to maintain the stability of currency values and to promote economic growth. In the long period of time in the past, China’s monetary policy was dominated by direct regulation, which was the use of tools such as credit scale and cash plans. After 1998, the control over the scale of loans was abolished, and indirect monetary policy tools were used to

control the total money supply. At this stage, China's monetary policy instruments mainly include open market operations, deposit reserves, refinancing and rediscounting, standing loan facilities, interest rate policies, exchange rate policies, etc.

Since 1998, in order to cope with the Asian financial crisis and the slowdown of the global economy, China has implemented an active fiscal policy that focuses on issuing long-term construction of national debt. In the following seven years, a total of 910 billion yuan of long-term construction treasury bonds were issued, and the average annual GDP growth was 1.5-2 percentage points. In the general downturn of the world economy, China's GDP grew at an average annual rate of 8% from 1998 to 2003. This has played an important role in expanding investment, stimulating domestic demand, and promoting stable economic growth. In response to the international financial crisis, China implemented a moderately loose monetary policy between 2008 and 2010. During the period, the central bank lowered the interest rates for deposits and loans five times while lowering the rediscount rate. In 2009, China’s interest rate policy remained basically stable. From 2003 to 2007, in order to maintain steady economic growth, China adopted a tight monetary policy. In 2004, the central bank liberalized the lower limit of the renminbi deposit interest rate and the upper limit of the loan interest rate. During this period, the deposit reserve ratio was raised 15 times (from 6% to 14.5%) and a differential deposit reserve ratio system was implemented. In 2008-2016, China adopted a monetary policy to restore the economy and maintain steady growth. In early 2008, the central bank implemented a tight monetary policy in order to prevent structural price increases from leading to inflation and overheating of the economy. In 2008, the central bank lowered the benchmark interest rate for RMB deposits in financial institutions for four consecutive times (from 4.14% to 2.25% in one year). At the same time, the benchmark interest rate for RMB deposits was lowered five times in a row (from 7.47% to 5.31% in one year). Moreover, the restrictions on commercial bank credit plans were removed and they were guided to expand the total amount of loans. From 2011 to 2012, the extreme turmoil in the international financial crisis has eased, and China’s economic performance is generally good. However, China still

faces problems such as rising domestic prices, overcapacity and other pressures, and the impact of the European debt crisis. Under the pressure of this series of factors, China's monetary policy has shifted from being moderately loose to stable, putting "stabilizing growth" at the top of macroeconomic policy control.

4. A Closer Look at the Financial and Business Cycle in China

In this chapter, I examine the relationship between the business cycle and the financial cycle in China. I collect quarterly data on China's real GDP and quarterly data on stock of bank loans from 1990 to 2017. HP filter analysis method, DCC-GARCH model, and Granger causality analysis method are used for the empirical analysis.

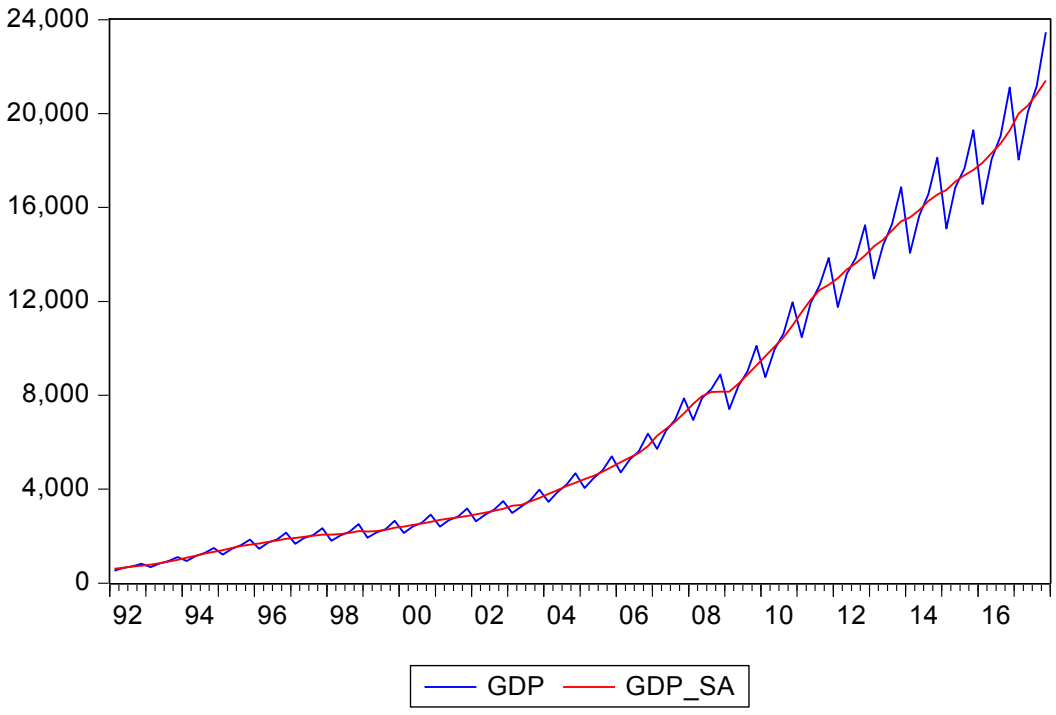
Liu Jinquan (2004) believes that the correlation between money and output essentially represents the relationship between the virtual economy and the real economy. The total amount of money can be used as a simple measure of the scale of the virtual economy, and the output can represent the basic characteristics and attributes of the real economy at the macro level. Cao Yongqin and Li Zexiang (2009) used Dynamic Conditional Correlation Model (DCC Model) and use Chinese M1 data and industrial added value to examine the correlation between China's business cycle and financial cycle in order to predict China's business cycle. He Dexu and Zhang Jie (2009) study the relationship between asset price bubbles and output fluctuations, credit extraordinary growth and financial instability. They found that the characteristics of the financial cycle of the modern economy have become increasingly apparent. It is necessary to pay attention to the impact of the financial cycle on macroeconomic policies. Borio (2014) studied the typical empirical characteristics of a long business cycle (about 16 years) and found that the financial cycle is characterized by the peak of credit supply and asset prices coincides with the financial crisis. This finding has a good effect on warning financial crisis. Aikman et al. (2015) recorded credit cycles based on frequency-filtered values and analyzed their relationship with the business cycle. They found that credit expansion is closely related to the emergence of a banking crisis. Shen et al. (2017) is the first group to construct China's financial cycle index. They found that China's

financial cycle coincided with about 60% of the business cycle, and when the two cycles are in the same period, the impact on the economy is greatest.

4.1 Data

The data used in this thesis is China's real GDP, bank loans, and credit-to-GDP for the period 1990-2017. The data comes from China National Bureau of Statistics, the Federal Reserve Bank of Atlanta, and BIS. Real GDP is the market value of all final products during the period calculated from the price of the base period from a previous period. The real GDP growth rate is the inflation-adjusted nominal GDP growth rate. The unit of China's real GDP is one hundred million yuan. Bank loans collected as stock data. In order to avoid excessive fluctuations in data, both real GDP and bank loans have been logarithmized.

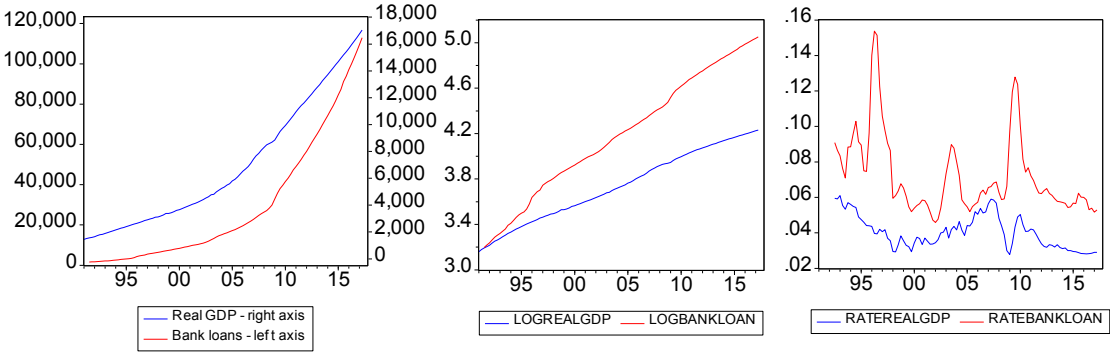
Figure 4-1 China's Quarterly GDP with and without the seasonal trend



Source: China National Bureau of Statistics

It can be seen from Figure 4-1 that there is seasonal fluctuation in China's GDP data, but the overall trend is still rising. Then use the X-12 method to eliminate seasonal factors to get the trend cycle sequence.

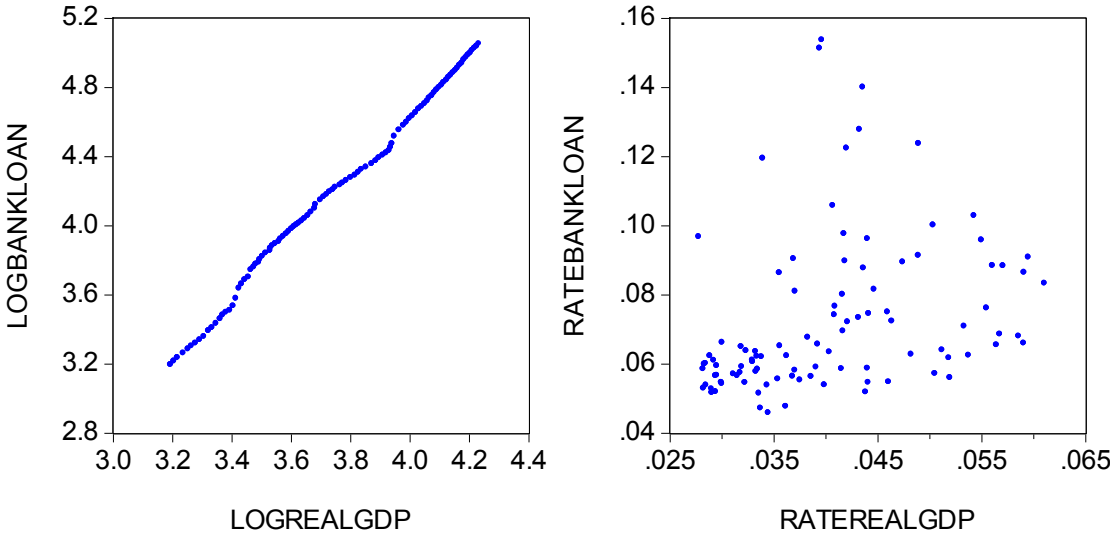
Figure 4-2 Real GDP and Bank Loans data



Source: https://www.frbatlanta.org/cqer/research/china-macroeconomy.aspx?panel=1

Figure 4-2 shows that the real GDP and bank loan trends are similar over time. Both time series gradually increase. Sometimes there are so-called abnormal points in the data, such as price factors, seasonal factors, etc., which can lead to the occurrence of abnormal results. When logarithmized, these outliers become smaller and retract within the desired range. Therefore, in order to avoid excessive fluctuations in the data, each data needs to be logarithmized. After the logarithmization, it can be seen that the trends of the two are more similar. It is more likely that there is a correlation between the two. However, there is no similar trend between the growth rate of real GDP and the growth rate of bank loans.

Figure 4-3 Real GDP and Bank Loans Scatterplots



Source: https://www.frbatlanta.org/cqer/research/china-macroeconomy.aspx?panel=1

To perform a simple bivariate analysis, I plot the data using scatterplots. As apparent, the stock of data taken in logs exhibit a clear positive correlation which is not surprising. However, there seems to be only weak correlation between real GDP growth rate and bank loan growth rate which may suggest some time-variation in the relationship and demands further analysis.

In the rest of this chapter, we will assume that the real GDP is a good proxy for the business cycle development and the stock of bank loans can proxy for the financial cycle. The simple bivariate analysis suggests some strong ties between the two in China. In the rest of the chapter, we check if the relationship can withstand some more demanding statistical tests.

4.2 H-P Filter Analysis

HP filtering was proposed by Hodrick and Prescott (1998) in analyzing post-war U.S. business cycles. It is currently one of the most widely used trend decomposition methods. The HP filter method is simple to use and does not set a series of assumptions on the sequence. At the same time, it is also a more appropriate method for forecasting potential output.

Let $\{Y_t\}$ be an economic time series with trending and fluctuating features, $\{Y_t^T\}$ reflect the trend components of the time series, and $\{Y_t^C\}$ reflect the wave components of the time series. The relationship between the three can be expressed as:

$$Y_t = Y_t^T + Y_t^C, \quad t = 1,2,3,\cdots,T \tag{4.1}$$

H-P filtering is to filter $\{Y_t^T\}$ from $\{Y_t\}$, by an algorithm. In general, the solution of minimization is usually used to represent the trend component $\{Y_t^T\}$ in $\{Y_t\}$.

$$\text{Min} \sum_{t=1}^{T} \left\{ (Y_t - Y_t^T)^2 + \lambda [c(L) Y_t^T]^2 \right\}, \quad t = 1,2,3\cdots,T \tag{4.2}$$

Where c (L) denotes the delay operator polynomial.

$$c(L) = (L - 1 - 1) - (1 - L) \tag{4.3}$$

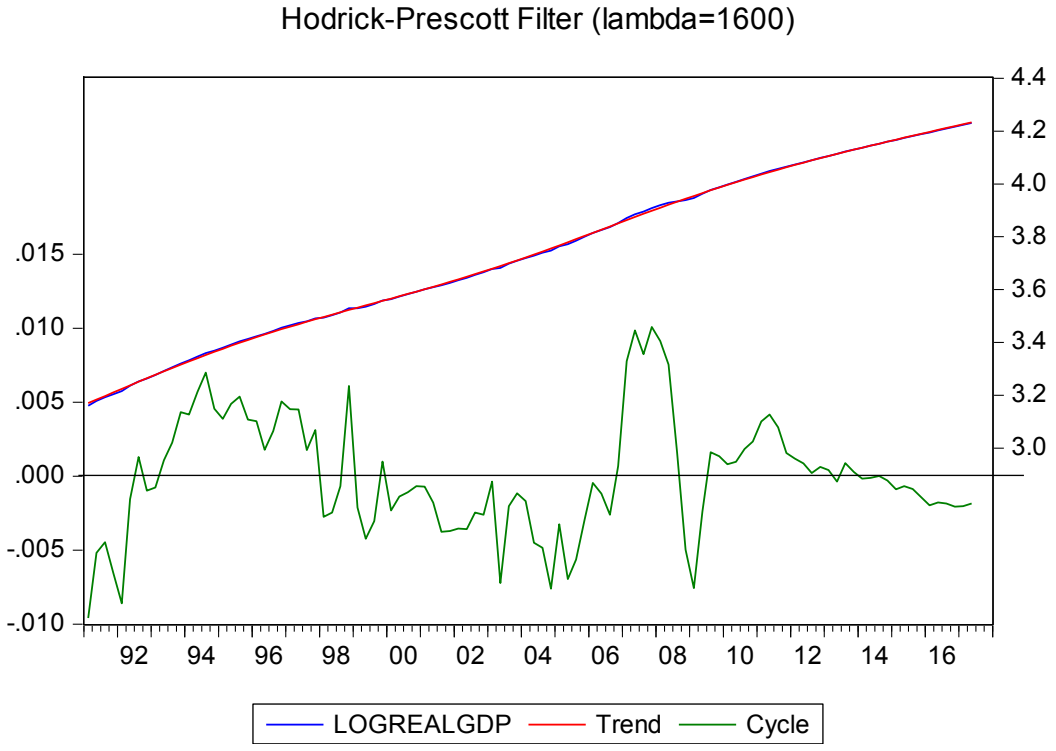
into (4.2), then the H-P filter problem is converted to the following function to reach the minimum:

$$\min\left\{\sum_{t=1}^{T}(Y_t - Y_t^T)^2 + \lambda \sum_{t=2}^{T-1}[(Y_{t+1}^T - Y_t^T) - (Y_t^T - Y_{t-1}^T)]^2\right\} \quad (4.4)$$

Use $[c(L)Y_t^T]^2$ to adjust for the trend change to solve the minimization problem and change as the parameter λ changes. Under normal circumstances, the value of λ follows the following rules:

$$\lambda = \begin{cases} 100 & \text{Annual data} \\ 1600 & \text{Quarterly data} \\ 14400 & \text{Monthly data} \end{cases} \quad (4.5)$$

Figure 4-4 Hodrick-Prescott Filter (China's GDP)

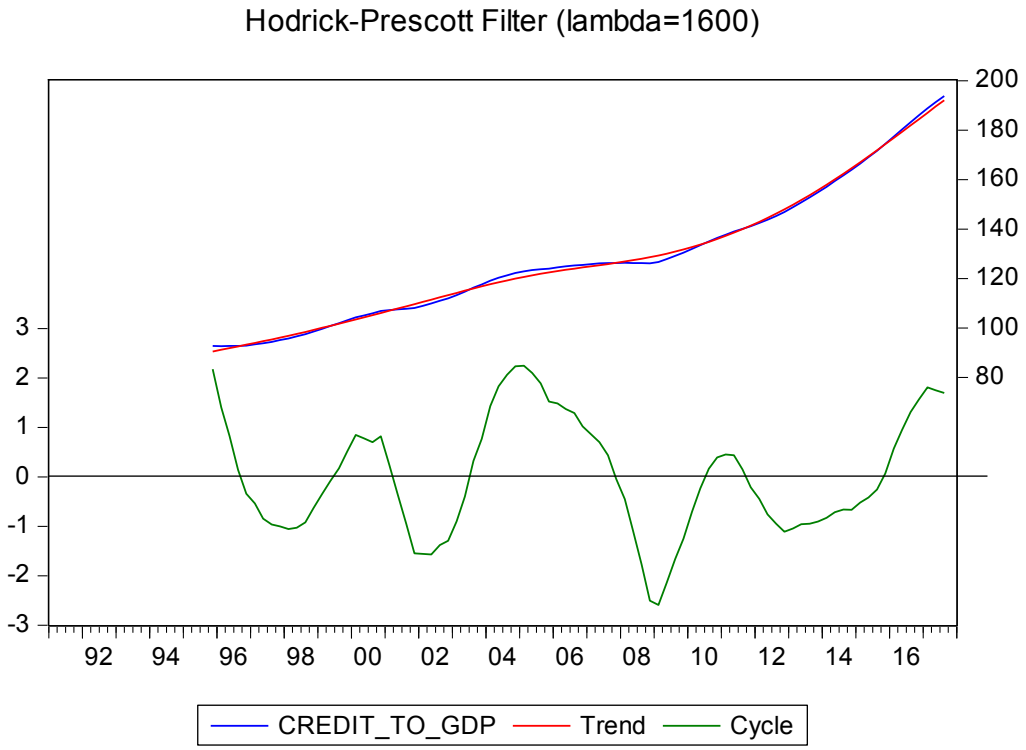


Source: China National Bureau of Statistics, own estimation

It can be seen from Figure 4-4 that the trend is steadily rising. This shows that China's quarterly output level continues to rise and its economic growth potential is relatively large. Economic fluctuations generally occur alternately between peaks and troughs,

showing cyclical changes. In 2006-2007, China's food prices increased significantly, resulting in a significant increase in GDP. In 2008, affected by the world financial crisis, China's economy was depressed. In 2009, the Chinese government introduced relevant policies to stimulate consumption, such as increasing investment in infrastructure. After 2013, China's economic development was in a period of stagnation and encountered many problems, such as the increase in labor costs. In late 2014 and early 2015, China's economic model began to change, shifting from manufacturing to high-tech industries. This has contributed to the development of China's economy.

Figure 4-5 Hodrick-Prescott Filter (Credit-to-GDP)



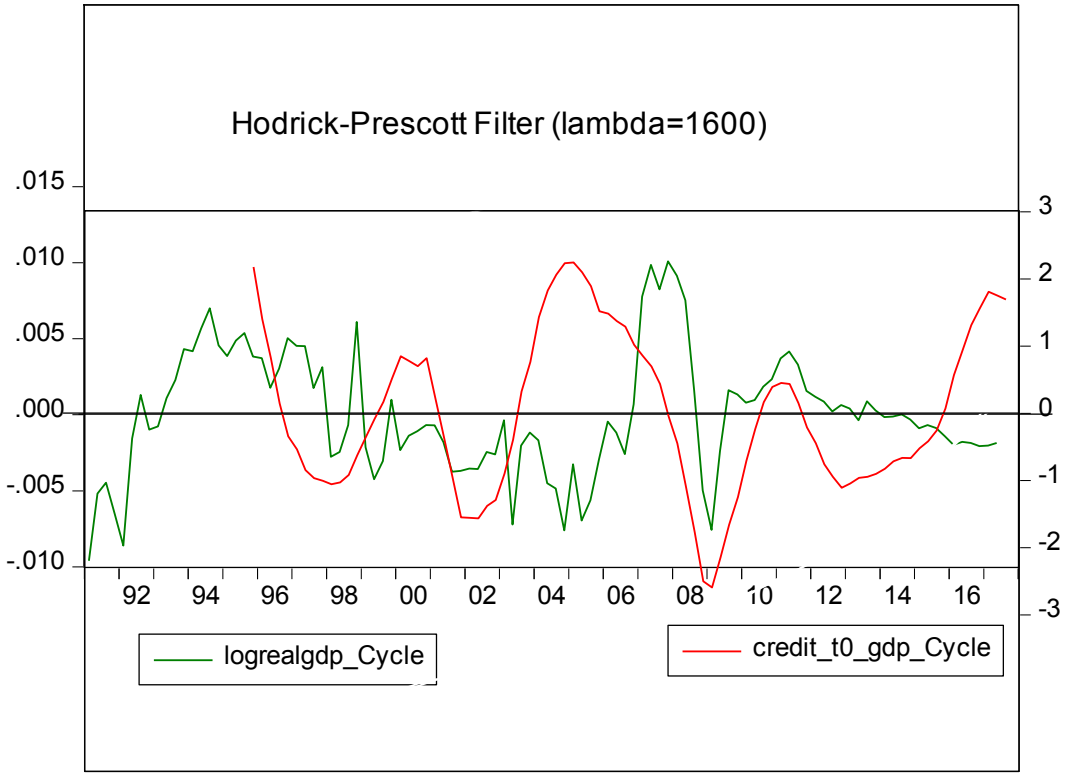
Source: own estimation

In terms of trend items, credit-to-GDP shows an upward-sloping curve, indicating that it is increasing every year. The process of sharp increase in the credit-to-GDP gap is precisely the gradual accumulation of financial risks and the gradual increase of financial vulnerabilities. The substantial reduction of the credit-to-GDP gap each time will be accompanied by a decline in the growth rate of the real economy. From the perspective of cyclical components, the trend of the credit-to-GDP gap generally

coincides with the trend of economic growth. The fall in the credit-to-GDP gap between 1995 and 1998 was accompanied by a fall in GDP growth from a high of 10.9% in the first quarter of 1996 to 6.9% in the second quarter of 1998. The fall in private sector credit-to-GDP gap between 2004 and 2008 was accompanied by a fall in GDP growth from 14.5% in the second quarter of 2007 to 6.4% in the first quarter of 2009. The fall in private sector credit-to-GDP gap between 2010 and 2012 was accompanied by a fall in GDP growth from 12.2% in the first quarter of 2019 to 7.9% in the first quarter of 2013.

In 2004-2006, the financial situation caused by declining credit growth and asset prices, devaluation of the RMB, and deleveraging of corporate and financial sectors declined. When the “subprime mortgage crisis” hit the domestic economy in 2008, the financial cycle index fell sharply due to the reduction of domestic and foreign demand. In 2011-2012, the economic decline mainly reflected the spillover effect of the European debt crisis on the Chinese economy. From 2009 to 2010, the main reason for economic growth was a series of measures to deal with the impact of the “subprime mortgage crisis” on the Chinese economy. The Chinese government has issued a “four trillion” fiscal stimulus plan, accompanied by 10 trillion new credits, leading to an unprecedented sharp increase in the financial cycle index.

Figure 4-6 Hodrick-Prescott Filter



Source: own estimation

As can be seen from Figure 4-6, credit-to-GDP cycle earlier than the period of GDP. The GDP cycle usually reaches a peak (or trough) some time after the credit-to-GDP cycle reaches its peak (or trough). The duration of the credit-to-GDP cycle is longer than the GDP cycle. It can also be said that the credit-to-GDP cycle occurs less frequently than the GDP cycle.

4.3 DCC-GARCH Model

Engle's (2002) DCC-GARCH model was developed based on the Constant Conditional Correlation model proposed by Bollerslev (1990). Let r_t be a revenue sequence with zero mean, then the specific model of DCC-GARCH is:

$$r_t|\emptyset_{t-1} \sim N(0, H_t) \tag{4.6}$$

$$D_t^2 = diag\{\omega_i\} + diag\{k_i\} o r_{t-1} r_{t-1}' + diag\{\lambda_i\} o D_{t-1}^2 \tag{4.7}$$

$$\varepsilon_t = D_t^{-1} r_t \tag{4.8}$$

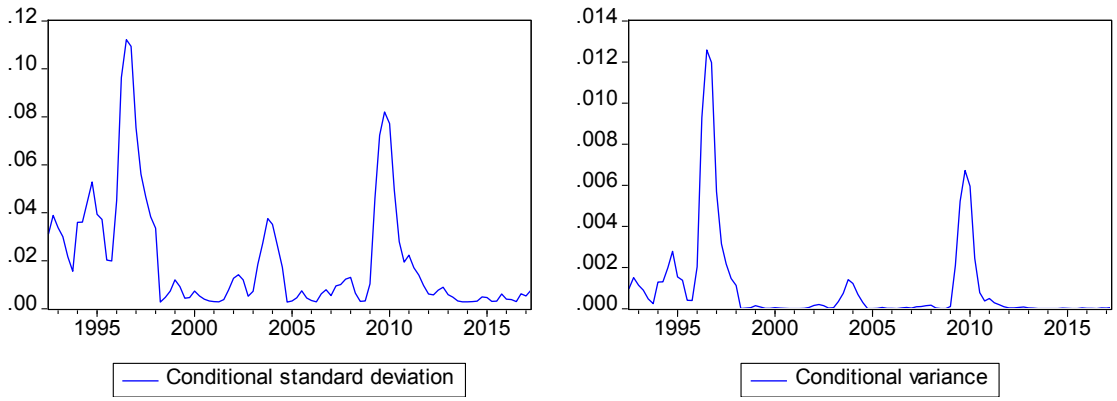
$$Q_t = S_O(\mu' - A - B) + A_{o\varepsilon_t + \varepsilon'_{t-i}} + B_o Q_{t-1} \quad (4.9)$$

$$R_t = diag\{Q_t^*\}^{-1} Q_t diag\{Q_t^*\}^{-1} \quad (4.10)$$

Among them,r_t is a series of yields with a mean of 0. $\emptyset_{t-1}$ is a collection of all possible information for the period t-1. H_t is the conditional covariance matrix, D_t^2 is a diagonal matrix, and the diagonal elements are the conditional variance of each variable. S is the unconditional covariance matrix of standardized residual ε_t. R_t is a conditional correlation coefficient matrix. The symbol " o " indicates the dot multiplication of the corresponding element of the matrix. Q_t is a conditional covariance matrix of standardized residuals. Q_t^* is a diagonal matrix whose diagonal matrix elements are the square roots of the Q_t diagonal elements.

The DCC-GARCH model adds explanatory variables to the mean equation, making the model more scientific and the estimated parameters more accurate. And the model also overcomes the effect of data variance. The model also reduces the amount of estimated parameters, making the calculation easier. Therefore, using this model can more accurately describe the correlation between data.

Figure 4-7 Conditional Standard Deviation and Conditional Variance of Bank Loans

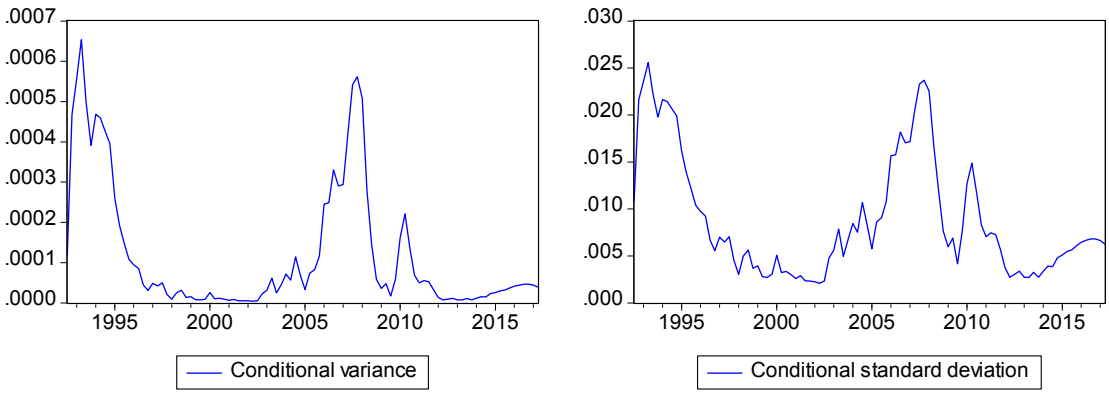


Source: own estimation

From Figure 4-7, it can be seen that the trend of the standard deviation and the conditional variance of the bank loan is roughly the same, with a large peak between 1996 and 1998. During this period of time, China encountered external shocks and internal adjustments and experienced economic growth. At the same time, problems

such as corporate losses, overcapacity, financial risks, deflation, and unemployment have also become prominent. There is a large peak between 2002 and 2004. In 2002, China experienced a relatively serious “dumping war”. Statistics show that in the first ten months of 2002, a total of 16 countries and regions launched 47 anti-dumping and safeguard measures investigations against China. At the same time, some cities in China began to open up to foreign banks. There is a big peak between 2008 and 2010. Affected by the global financial crisis in 2008, the Chinese economy has also experienced significant fluctuations.

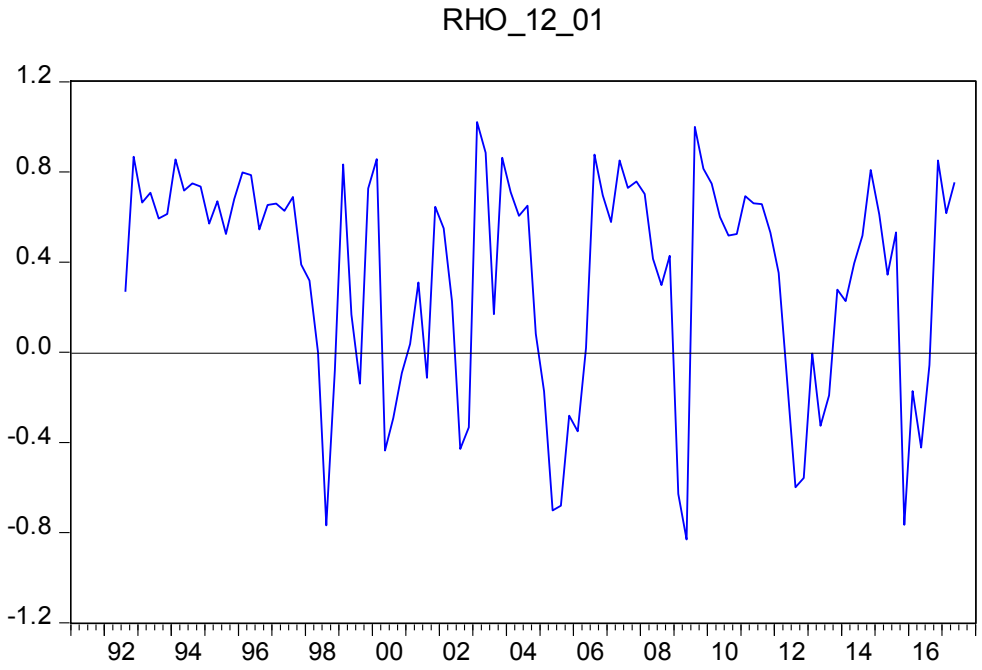
Figure 4-8 Conditional Standard Deviation and Conditional Variance of GDP



Source: own estimation

From the above figure, we can see that the fluctuation trend of China's GDP is basically consistent with the fluctuation of bank loans. Between 2010 and 2012, China's GDP has changed significantly. During this period, China experienced relatively moderate inflation and the GDP growth rate suddenly slowed down.

Figure 4-9 DCC-GARCH Model



Source: own estimation

From Figure 4-9, we can see that the correlation between China's GDP and bank loan growth shows a dynamic and time-varying characteristic, and the correlation coefficient is highly volatile. The highest correlation coefficient is about 1.00, and the lowest is about -0.83. There is a positive correlation between GDP growth and bank loan growth, indicating that the linkage between GDP and bank loans is based on positive linkages and has a mutually reinforcing effect. However, in a few cases, the correlation coefficient between GDP growth and bank loan growth is negative. There is also a negative correlation between GDP growth and bank loan growth.

As can be seen from the above, there is a dynamic correlation between the business cycle and the financial cycle in China. The correlation between the two changes over time, and the dynamic correlation is continuously changing. In other words, the dynamic fluctuations in China's business cycle and financial cycle are long-term.

4.4 Granger Causality

Clive W.J. Granger (2003) believes that the Granger causality test is a variance of the least-squares prdiction that relies on the use of all information at some point in the past.

In the case of time series, there are two prediction methods. The first is to predict the variable Y under the condition that it contains all the past information of the variable X and the variable Y. The second is to predict the variable Y only on the condition that it contains all the past information of the variable Y. If the prediction effect of the first method is better than the prediction effect of the second method, that is, adding the variable X helps explain the future change of the variable Y, then the variable X can be considered as the Granger cause of the variable Y. It should also be noted that Granger's causality test is for time series. It can increase the accuracy between time variables, which shows a statistical causal relationship. The test results only reflect the time sequence and cannot explain causality. A prerequisite for the Granger causality test is that the time series must be stationary, otherwise it may lead to false return problems. The Granger causality test assumes that all of the variables Y and X are included in the time series of these variables. Inspection requirements estimate the following regressions:

$$Y_t = \sum_{i-1}^{q} \alpha_i X_{t-i} + \sum_{j-1}^{q} \beta_j Y_{t-1} + u_{1t} \quad (4.11)$$

$$X_t = \sum_{I-1}^{S} \gamma_i X_{t-i} + \sum_{j-1}^{s} \delta_j Y_{t-j} + u_{2t} \quad (4.12)$$

Which, u_{1t} and u_{2t} are assumed to be irrelevant.

Granger causality test will appear the following four results.

The first case is that X is the cause of the Y change, that is, there is a one-way causal relationship from X to Y. If the estimate of the lag coefficient for X in equation (4.11) is statistically significant not zero, and the estimate of the lag coefficient for Y in equation (4.12) is statistically significant at zero. Then it can be said that X is the cause of the Y change.

The second case is that Y is the cause of the X change, that is, there is a one-way causal relationship from Y to X. If the estimate of the lag coefficient for X in formula (4.11) is statistically significant at zero, and the estimate of the lag coefficient for Y in formula (4.12) is not statistically significant at zero. Then it can be said that Y is the cause of

the X change.

The third case is that X and Y are causal relationships, that is, there is both a one-way causality from X to Y and a one-way causality from Y to X. If the estimate of the lag coefficient for X in formula (4.11) is statistically significant not zero, the estimate of the lag coefficient for Y in formula (4.12) is not statistically significant at zero. Then there can be a two-way causal relationship between X and Y.

The fourth case is that there is no causal relationship between X and Y, that is, X and Y are independent. If the estimate of the lag coefficient for X in equation (4.11) is statistically significant at zero, the estimate of the lag coefficient for Y in equation (4.12) is statistically significant at zero. Then there can be no causal relationship between X and Y.

The first step is to test the stability of the Log GDP.

Table 4-1 Unit Root Test of Log GDP

Null Hypothesis: LOGREALGDP has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.368598	0.5948
Test critical values:	1% level	-3.496346	
	5% level	-2.890327	
	10% level	-2.582196	

*MacKinnon (1996) one-sided p-values.

Source: own estimation

As can be seen from Table 4-1, ADF = -1.368598, its absolute value is less than each critical value. This shows that the sequence is non-stationary. Therefore, a further unit root test is performed, and the first difference is first performed.

Table 4-2 Unit Root Test (First-Order Differential) of Log GDP

Null Hypothesis: D(LOGREALGDP) has a unit root
Exogenous: Constant

Lag Length: 3 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.129160	0.2339
Test critical values:	1% level	-3.496346	
	5% level	-2.890327	
	10% level	-2.582196	

*MacKinnon (1996) one-sided p-values.

Source: own estimation

As can be seen from Table 4-2, ADF =-2.129160, its absolute value is less than each critical value. This shows that the sequence is non-stationary. Therefore, the second-order differential root test.

Table 4-3 Unit Root Test (Second-Order Differential) of Log GDP

Null Hypothesis: D(LOGREALGDP,2) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.37235	0.0001
Test critical values:	1% level	-3.496346	
	5% level	-2.890327	
	10% level	-2.582196	

*MacKinnon (1996) one-sided p-values.

Source: own estimation

As can be seen from Table 4-3, ADF =-13.37235, its absolute value is greater than the critical value. It cannot be denied that GDP is a unit root process with constant and trend terms.

The next step is to test the stability of log bank loans.

Table 4-4 Unit Root Test of Log Bank Loans

Null Hypothesis: LOGBANKLOAN has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-1.473016	0.5432
Test critical values:	1% level	-3.497727	
	5% level	-2.890926	
	10% level	-2.582514	

*MacKinnon (1996) one-sided p-values.

Source: own estimation

From the results of the unit root test, we can not reject the original hypothesis. This shows that the sequence is non-stationary. Therefore, it is necessary to perform a unit root test on the first-order differential.

Table 4-5 Unit Root Test (First-Order Differential) of Log Bank Loans

Null Hypothesis: D(LOGBANKLOAN) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.059041	0.0330
Test critical values:	1% level	-3.497727	
	5% level	-2.890926	
	10% level	-2.582514	

*MacKinnon (1996) one-sided p-values.

Source: own estimation

From the results of the unit root test of the first-order difference, we can see that the original hypothesis can be rejected. The data are stable.

We proceed with the Granger causality test. To test for different lags in the relationship, we estimate the test using one, four and twelve quarters lag. The trade-off of choosing very low or high lag is between bias and power. Too few lags increase the risk of a biased test because of the residual auto-correlation. Too many lag means that we allow for potentially spurious rejections of the null hypothesis (in another word, some random correlation might make it look like X helps predict Y).

Table 4-6 Granger Causality Tests (1 quarter)

Pairwise Granger Causality Tests

Date: 05/07/18 Time: 09:57
Sample: 1991Q1 2017Q4
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
DD_GDP does not Granger Cause D_BANK	102	0.26066	0.6108
D_BANK does not Granger Cause DD_GDP		0.29023	0.5913

Source: own estimation

At the 10% level of significance, the P-value corresponding to the F-statistic is 0.6108 more than 10%, and the original hypothesis cannot be rejected, which means that the growth of GDP is not the Granger cause of bank loans growth. At the 10% level of significance, the P-value corresponding to the F statistic is 0.5913 and more than 10%, the null hypothesis cannot be rejected, that is, the growth of bank loans is not a Granger cause of GDP growth. Therefore, in the four-month period, changes in GDP do not have the ability to predict changes in bank loans, and changes in bank loans also do not have the ability to predict GDP changes.

Table 4-7 Granger Causality Tests (1 Year)

Pairwise Granger Causality Tests
Date: 05/07/18 Time: 09:58
Sample: 1991Q1 2017Q4
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
DD_GDP does not Granger Cause D_BANK	99	1.79484	0.1368
D_BANK does not Granger Cause DD_GDP		2.38363	0.0572

Source:https://www.frbatlanta.org/cqer/research/chinamacroeconomy.aspx?panel=1

At the 10% significance level, the P-value corresponding to the F-statistic is 0.1368 more than 10%, which cannot reject the null hypothesis that the growth of GDP is the Granger cause of the growth of bank loan. And at the 10% significance level, the P-value corresponding to the F statistic is 0.0572 and less than 10%, the null hypothesis can be rejected, that is, the growth of bank loans is a Granger cause of GDP growth. Therefore, in the one-year period, changes in GDP do not have the ability to predict

changes in bank loans, and changes in bank loans have the ability to predict GDP changes.

Table 4-8 Granger Causality Tests (3 Years)

Pairwise Granger Causality Tests
Date: 05/07/18 Time: 09:58
Sample: 1991Q1 2017Q4
Lags: 12

Null Hypothesis:	Obs	F-Statistic	Prob.
DD_GDP does not Granger Cause D_BANK	91	1.35514	0.2103
D_BANK does not Granger Cause DD_GDP		1.96511	0.0419

Source: own estimation

At the 10% level of significance, the P-value corresponding to the F-statistic is 0.2103 more than 10%, and the null hypothesis cannot be rejected, which means that the growth of GDP is not the Granger cause of bank loans growth. Similarly, at the 10% level of significance, the P-value corresponding to the F-statistic is 0.0419 and less than 10%, and the null hypothesis can be rejected, that is, the growth of bank loan is the Granger cause of the growth of GDP. Therefore, in the two-year period, changes in GDP do not have the ability to predict changes in bank loans, and changes in bank loans have the ability to predict GDP changes.

In a quarter, the growth of GDP is not the Granger cause for the growth of bank loans. The growth of bank loans is not the Granger cause of GDP growth. In other words, in the short term, both have no ability to predict each other. In one year and two years, the growth of bank loans is the Granger cause of GDP growth, the growth of GDP is not the Granger cause for the growth of bank loans. In other words, in the long run, you can use bank loans to forecast GDP. However, you cannot use the growth rate of GDP to predict the growth of bank loans.

GDP is an important measure of the business cycle, and bank loans are an important indicator of the financial cycle. It can be speculated that in a quarter, there is no mutual ability to predict each other between the two cycles. In one year and two years, the

financial cycle has the ability to predict the business cycle, and the business cycle has no ability to predict the financial cycle.

There is a dynamic correlation between China's financial cycle and business cycle. The degree of correlation between the two changes with the characteristics of time and periodic fluctuations. And this dynamic correlation is continuously changing. That is to say, the dynamic fluctuation between China's business cycle and financial cycle has a long-term nature.

Business cycle and financial cycle have common development trend in the process of fluctuation. China's financial cycle can affect the business cycle. The development in the financial sector is conducive to the growth of the Chinese economy.

5. Conclusion

With the advancement of financial market reforms and the deepening of reform and opening up, China is undergoing a process of financial deepening. Business cycle fluctuations and financial cycle fluctuations are an important phenomenon in modern economic life and they have their own rules of objective operation.

Based on China's 1990-2017 quarterly data, I conducted a more systematic empirical analysis of the correlation between the business cycle and the financial cycle. I used HP filter analysis method, DCC-GARCH model and Granger causality test to analyze the relevant data. The HP filter analysis method is simple to use and does not set a series of assumptions on the sequence. Generally, this model can be used as long as the trend is stable. The average equation of the DCC-GARCH model is increased by explanatory variables, which makes the model more scientific and its estimated parameters are more accurate. At the same time, the model sea overcomes the impact of data variance on the results. It reduces the amount of estimated parameters and makes the calculation easier. Using the Granger causality test can improve the accuracy of predictions between time variables. In order to determine whether the sequence is statistically causal.

After the dual theoretical and empirical analysis of this thesis, the following conclusions have been drawn on the relationship between the business cycle and the financial cycle in China:

There is a dynamic correlation between the financial cycle and the business cycle in China, and the degree of correlation changes with the characteristics of time and periodic fluctuations. The dynamic fluctuation between China's business cycle and financial cycle has a long-term nature.

Business cycle and financial cycle have common development trend in the process of fluctuation. The development of the financial industry is conducive to the growth of China's economy.

I propose the following policy recommendations. First, in the process of stimulating the economy through credit expansion, it is necessary to guard against excessive expansion of credit and create a bubble economy. This will lead to a downturn in the financial cycle, which will in turn affect China's economic development. At the same time, it will ensure stable monetary and financial stability, real economic stability, stable asset prices, and stable commodity prices. Second, with the help of financial development, it promotes the active, rational and effective flow of factors between departments, and promotes industrial rationalization and transformation and upgrading. This can promote the healthy development of China's economy. Third, actively carry out financial innovation, improve loan efficiency and benefit, optimize the direction and structure of credit, improve a diversified financial system, strengthen the supervision of the financial system, and guard against systematic financial risks. This will promote the healthy and orderly development of the financial industry and thus promote economic development. At the same time, it could also avoid the downturn in China's economy caused by the downturn in the financial industry. Finally, the coordination between macro-prudential supervision policies and micro-prudential supervision policies should be strengthened. Monetary policy control should be closely integrated with financial reforms to promote the coupling between financial elements and the real economy.

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List of Abbreviation

CPI …… Consumer Price Index.

DCC GARCH ……Dynamic Conditional Correlation Generalized AutoRegressive Conditional Heteroskedasticity

GDP …… Gross Domestic Product

HP …... Hodrict-Prescott filter

M1…… Narrow money

RMB…… Reminbi (the system of currency of the People's Republic of China)

US …… United States

WTO …… World Trade Organization

WWII …… Second World War

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Ostrava dated 07.05.2018

尚泊林 Shang Bolin

Annex

Time	Bank Loan(100 million yuan)	Log Bank Loan	Rate Bank Loan	Real GDP(100 million yuan)	Log Real GDP	Rate Real GDP	Credit-to-GDP
1991Q1				1447.7981	3.160708		
1991Q2				1508.8005	3.178632		
1991Q3	1573.287	3.196808		1559.0541	3.192861		
1991Q4	1650.345	3.217575		1600.5803	3.204277		
1992Q1	1726.443	3.237152		1643.1151	3.215668		
1992Q2	1831.629	3.262838		1722.3778	3.236128		
1992Q3	1939.656	3.287725	0.0909169	1787.909	3.252345	0.059484	
1992Q4	2014.189	3.3041	0.0865255	1833.7499	3.26334	0.059063	
1993Q1	2091.809	3.320522	0.0833697	1891.0856	3.276711	0.061043	
1993Q2	2182.877	3.339029	0.0761917	1956.9671	3.291584	0.055455	
1993Q3	2283.792	3.358657	0.0709318	2021.3794	3.305648	0.053302	
1993Q4	2469.01	3.392523	0.0884226	2091.1615	3.320388	0.057047	
1994Q1	2564.74	3.409043	0.0885213	2151.4857	3.332738	0.056027	
1994Q2	2722.293	3.434935	0.0959055	2220.9876	3.346546	0.054963	
1994Q3	2894.405	3.461559	0.1029027	2290.3894	3.359909	0.054261	
1994Q4	3047.407	3.483931	0.0914076	2340.3526	3.369281	0.048894	
1995Q1	3151.675	3.498541	0.0894982	2399.6952	3.380156	0.047418	
1995Q2	3235.835	3.509986	0.0750516	2468.8014	3.392486	0.04594	
1995Q3	3436.879	3.536164	0.0746049	2535.3346	3.404035	0.044126	
1995Q4	3803.111	3.580139	0.0962085	2589.9327	3.413288	0.044007	92.7
1996Q1	4351.384	3.638627	0.140086	2652.965	3.423732	0.043575	92.6
1996Q2	4609.788	3.663681	0.1536946	2704.55	3.432095	0.039609	92.7
1996Q3	4869.998	3.687529	0.1513646	2776.1152	3.443437	0.039402	92.7
1996Q4	5041.664	3.702574	0.1224349	2852.8908	3.455285	0.041997	92.9
1997Q1	5551.692	3.744425	0.105798	2913.4906	3.464414	0.040682	93.4
1997Q2	5772.193	3.761341	0.0976599	2977.3658	3.473832	0.041737	93.8
1997Q3	5998.07	3.778011	0.0904827	3022.3436	3.480344	0.036906	94.4
1997Q4	6151.848	3.789006	0.0864317	3096.0245	3.490804	0.035519	95.1
1998Q1	6367.173	3.803947	0.0595212	3118.1427	3.493896	0.029482	95.8
1998Q2	6643.045	3.822367	0.0610264	3184.6108	3.503056	0.029224	96.6
1998Q3	6944.013	3.841611	0.063599	3262.8133	3.513592	0.033248	97.5
1998Q4	7190.103	3.856735	0.0677295	3381.1864	3.529069	0.038265	98.6
1999Q1	7399.65	3.869211	0.0652646	3384.4516	3.529488	0.035592	99.7
1999Q2	7637.872	3.882972	0.0606052	3435.5968	3.536002	0.032946	100.8
1999Q3	7874.925	3.896246	0.0546359	3514.0585	3.545809	0.032217	101.9

1999Q4	8104.262	3.908713	0.0519784	3618.0213	3.558471	0.029402	103.1
2000Q1	8378.121	3.923147	0.0539355	3662.9822	3.563835	0.034347	104.3
2000Q2	8676.843	3.938362	0.0553894	3745.4817	3.573508	0.037505	105.1
2000Q3	8968.014	3.952696	0.0564498	3824.7114	3.582599	0.03679	105.9
2000Q4	9272.968	3.967219	0.0585053	3907.4066	3.591889	0.033417	106.9
2001Q1	9578.617	3.981303	0.0581562	3988.9539	3.600859	0.037024	107.2
2001Q2	9862.68	3.993995	0.0556332	4063.2779	3.608877	0.035369	107.5
2001Q3	10098.01	4.004236	0.0515395	4132.0489	3.616165	0.033567	107.8
2001Q4	10338.43	4.014455	0.0472358	4222.8921	3.62561	0.033721	108.1
2002Q1	10646.78	4.027218	0.0459155	4318.431	3.635326	0.034467	109
2002Q2	11008.24	4.041718	0.0477228	4415.8109	3.64501	0.036134	109.9
2002Q3	11433.68	4.058186	0.0539504	4529.248	3.656026	0.039861	111
2002Q4	11965.9	4.077945	0.0634907	4633.9392	3.66595	0.04034	112
2003Q1	12607.37	4.100624	0.073406	4769.3668	3.678461	0.043135	113.3
2003Q2	13267.27	4.122782	0.0810639	4808.9793	3.682053	0.037042	114.7
2003Q3	14059.39	4.147966	0.0897803	4987.5101	3.697884	0.041858	116.3
2003Q4	14644.03	4.165661	0.0877153	5123.4873	3.709566	0.043615	117.6
2004Q1	15162.14	4.180761	0.0801362	5248.6162	3.720045	0.041584	119.1
2004Q2	15673.79	4.195174	0.0723925	5350.5246	3.728396	0.046343	120.3
2004Q3	16092.18	4.206615	0.0586484	5487.7447	3.739394	0.04151	121.3
2004Q4	16674.68	4.222057	0.056397	5599.3578	3.748138	0.038573	122.2
2005Q1	17197.12	4.235456	0.0546951	5809.2968	3.764124	0.044079	122.9
2005Q2	17662.82	4.24706	0.051886	5918.4579	3.772209	0.043812	123.4
2005Q3	18256.91	4.261427	0.0548125	6101.1852	3.785414	0.04602	123.8
2005Q4	18974.06	4.27816	0.0561027	6310.6844	3.800076	0.051938	124
2006Q1	19619.76	4.292694	0.057238	6525.3162	3.814602	0.050478	124.5
2006Q2	20396.26	4.30955	0.0624904	6698.098	3.825951	0.053743	124.9
2006Q3	21157.86	4.325472	0.0640443	6864.3494	3.836599	0.051185	125.3
2006Q4	21874.44	4.339937	0.0617767	7110.9864	3.85193	0.051853	125.5
2007Q1	22815.66	4.358233	0.0655395	7430.2495	3.871003	0.056402	125.8
2007Q2	23745.5	4.375581	0.0660309	7673.4833	3.884993	0.059041	126.1
2007Q3	24746.82	4.393519	0.0680477	7855.3145	3.895164	0.058564	126.3
2007Q4	25620.04	4.40858	0.068643	8103.3285	3.908663	0.056734	126.3
2008Q1	26367.97	4.421077	0.0628436	8302.7967	3.919224	0.048221	126.4
2008Q2	27187.17	4.434364	0.0587826	8491.2972	3.928974	0.043981	126.3
2008Q3	28353.26	4.452603	0.0590836	8594.5525	3.934223	0.03906	126.2
2008Q4	29841.59	4.474822	0.0662421	8683.4697	3.938693	0.03003	126.1
2009Q1	32957.41	4.517953	0.0968764	8850.9583	3.94699	0.027766	126.7
2009Q2	35798.89	4.55387	0.1195056	9181.1697	3.962898	0.033924	127.9
2009Q3	38060.11	4.58047	0.1278671	9494.6336	3.977478	0.043255	129.2
2009Q4	39682.33	4.598597	0.1237752	9718.7465	3.98761	0.048917	130.5
2010Q1	41513.96	4.618194	0.100241	9938.2009	3.997308	0.050317	132
2010Q2	43201.34	4.635497	0.0816277	10175.28	4.007546	0.044648	133.5

2010Q3	45153.43	4.654691	0.0742206	10430.439	4.018303	0.040824	135
2010Q4	47346.22	4.675285	0.0766881	10678.536	4.028512	0.040901	136.4
2011Q1	49021.75	4.690389	0.0721946	10949.695	4.039402	0.042094	137.7
2011Q2	50700.39	4.705011	0.069514	11199.739	4.049208	0.041662	139
2011Q3	52532.41	4.720427	0.0657366	11415.924	4.057511	0.039209	140.1
2011Q4	54663.82	4.7377	0.0624146	11607.995	4.064757	0.036245	141.2
2012Q1	56553.98	4.752463	0.0620744	11835.656	4.073192	0.03379	142.5
2012Q2	58733.03	4.768882	0.0638711	12064.686	4.081516	0.032308	143.8
2012Q3	61015.54	4.78544	0.0650131	12284.748	4.089366	0.031855	145.3
2012Q4	63076.93	4.799871	0.0621706	12535.308	4.098135	0.033378	146.9
2013Q1	65098.39	4.81357	0.0611071	12767.804	4.106116	0.032924	148.8
2013Q2	67309.86	4.828079	0.0591963	12984.625	4.113429	0.031913	150.8
2013Q3	69697.24	4.843216	0.0577751	13263.056	4.122644	0.033277	152.8
2013Q4	72009.06	4.857387	0.0575166	13486.484	4.129899	0.031764	154.9
2014Q1	74249.08	4.870691	0.0571209	13715.507	4.137212	0.031096	157.1
2014Q2	76682.63	4.884697	0.0566183	13961.242	4.144924	0.031495	159.4
2014Q3	78984.1	4.89754	0.0543241	14211.589	4.152643	0.029999	161.7
2014Q4	81669.15	4.912058	0.0546708	14448.823	4.159832	0.029934	164
2015Q1	84610.73	4.927425	0.0567343	14679.331	4.166706	0.029494	166.5
2015Q2	87349.2	4.941259	0.056562	14938.629	4.174311	0.029387	169
2015Q3	91187.84	4.959937	0.0623972	15187.171	4.181477	0.028834	171.6
2015Q4	93806.85	4.972235	0.0601765	15426.3	4.188262	0.028429	174.4
2016Q1	97141.47	4.987405	0.0599793	15667.53	4.195001	0.028294	177.4
2016Q2	99962.04	4.999835	0.0585762	15939.899	4.202486	0.028175	180.3
2016Q3	103022.9	5.012934	0.0529967	16206.388	4.209686	0.028209	183.2
2016Q4	106200.1	5.026125	0.0538903	16471.716	4.216739	0.028477	186
2017Q1	109413.3	5.03907	0.0516653	16750.408	4.224025	0.029025	188.8
2017Q2	112901.3	5.052699	0.052864	17039.995	4.231469	0.028984	191.3
2017Q3							193.8
2017Q4							